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Times-**

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MONITORING DISASTER COMMUNICATIONS



In this issue:

- **Chasing FM-DX**
- **MT Looks at e-Readers**
- **World of Weird Antennas**

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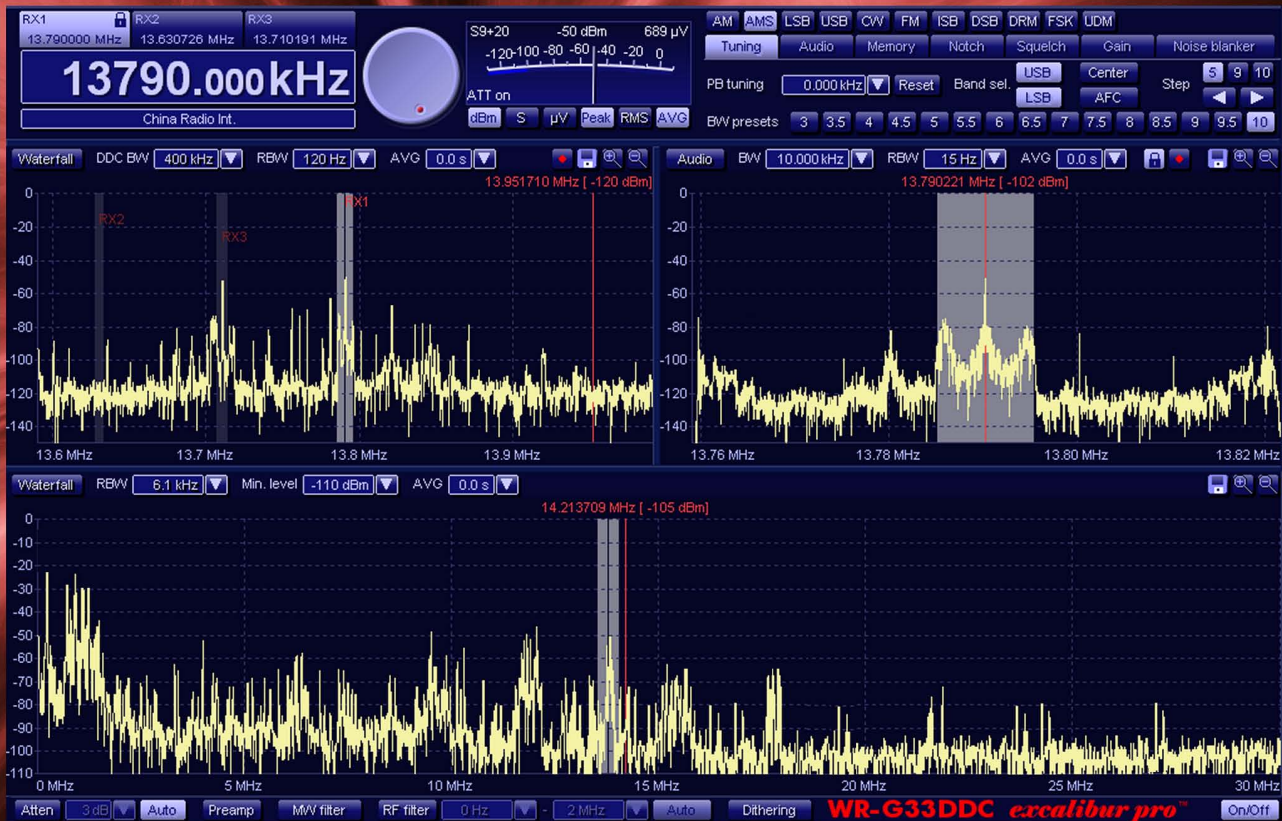
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Cover Story 8

Monitoring Disaster Communications

By Chris Parris

The catastrophe that struck Japan's northeast coast this year came without warning. Between the damage inflicted by the earthquake and the unbelievable effects of the tsunami that followed, the area will be years, if not decades, in recovery. This year, in the U.S., we've seen crippling winter storms, horrific tornado damage and find ourselves now at the sixth anniversary of the formation of Hurricane Katrina, one of this country's greatest natural disasters.

MT's Fed Files columnist, Chris Parris, ponders the issues involved in trying to prepare for such emergencies; what happens to infrastructure, including radio communications, and what a person possibly at the center of such a scene might do to find out what's happening and where.

If you live in an area prone to earthquake, hurricanes, tornadoes, or severe winter storms, Chris has some advice on what to do before the worst happens.

On Our Cover

In the aftermath of Hurricane Katrina the Federal Emergency Management Agency (FEMA) erected portable communications towers such as this 100 foot tower to replace the Jefferson Parish Sheriff's Department tower which was toppled by the storm. (Marvin Nauman/FEMA Photo)

C O N T E N T S

World of Weird Antennas 11

By Mark Haverstock K8MSH

It's a wireless world and that means antennas everywhere. But, many Americans have a schizophrenic attitude about antennas. They want the convenience of the services antennas bring, but their eyesight is offended by the presence of those very antennas. Mark Haverstock K8MSH looks at the many ways antennas can be disguised and the strange shapes that specialty antennas require. From cartoon rabbit ears to a plywood buffalo, there's a world of weird antennas out there!



DXing the FM Band in a Translator/booster World.... 15

By Ken Reitz KS4ZR

The landscape of America's FM band has dramatically changed over the last 10 years and FM DX has been severely hampered. Thousands of new transmitters have cluttered up the once wide open, static-free, high fidelity band to which audiophiles once retreated to hear beautiful music. It's never been harder to pull in distant FM signals, but the good news is that it's still possible.

Reading MT on an iPad 17

By Gordon Bousman NW7D

Longtime MT reader Gordon Bousman NW7D travels a lot (200,000 miles a year!). He explains how he takes MT, and many other books and magazines, with him on trips without adding any extra weight to his briefcase. And, on flights with Wifi, he can even explore the hot links in the articles and ads, just as he can at home.



MT Looks at e-Readers 18

By Bill Grove

With the swarm of digital devices constantly inundating the market, it can be a daunting task to decide which ones are just a fad or which ones hold merit. E-book readers are one of those devices that seem to be gathering quite a following. But are they just a fad or are they something that you should consider adding to your repertoire of gadgets and gizmos? Bill has the answers.

R E V I E W S

Apple TV – Let it change your life 68

By Loyd Van Horn, W4LVH

If you want to combine streaming audio or video from your iOS device or computer with your home entertainment system, Loyd explains how much easier Apple TV makes everything. For \$99 he can't think of a more practical and useful device to add to your home entertainment system.

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I have been a long time subscriber--off and on--since the early eighties when the format was newsprint. Through the years your staff and contributing writers have done a great job in producing some very informative articles. -Mark C.

Have downloaded my first copy of MTXpress. The clarity of the pages is breathtaking; very easy to read. This is a brilliant idea: Wish I had known about it earlier. - Barry, UK

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COMMUNICATIONS

by Ken Reitz



SHORTWAVE/AMATEUR RADIO

Commando Solo on HF over Libya

The USAF EC-130J aircraft, known as *Commando Solo*, is airborne and getting HF airtime over Libya during on-going NATO operations there. Frequencies reported by various monitors (*MT* Assistant Editor Larry Van Horn's <http://mt-milcom.blogspot.com> and French language <http://signal-monitoring.blogspot.com>) are updated on those websites as reported. Hugh Stegman NV6H, *MT*'s *Utility World* columnist, reports there is little chance for stateside reception, but listeners on the East Coast around 6:00 a.m. would have the best shot.



Commando Solo EC-130J is in the air and on the air in support of NATO operations in Libya. (Courtesy: USAF Special Operations Command Public Affairs Office)

The aircraft, according to the public affairs office for the USAF Special Operations Command, is equipped to provide, "information operations, psychological operations and civil affairs broadcasts in AM, FM, HF, TV and military communications bands." The aircraft has an altitude ceiling of 28,000 feet, cruises at 335 mph, has an unrefueled range of 2,300 nautical miles and a crew of 11, including five electronic communications systems operators.

BBG to "Sunset" Shortwave

In early June the government watchdog group <http://governmentattic.org> (actual motto: "Rummaging in the Government's Attic") forced the release, through a Freedom of Information Act request, of the Broadcasting Board of Governors' 2010-12 *BBG Technology Strategic Plan*, a 174-page plan for the future of technology at the BBG which is in charge of operating the Voice of America, Radio Free Europe, and Radio Free Asia, as well as Radio and Television Martí. This document is not to



Voice of America satellite TV feed. (Courtesy: Ken Reitz KS4ZR)

be confused with the *BBG 2008-2013 Strategic Plan*, a 13 page document setting out a five-year plan previously available on the BBG web site.

As might be expected *The Plan* focused on changing the way State Department information is disseminated around the world and it's nothing new: Out with shortwave and in with IT. According to the document, we are currently in Year 2 (June 2011-June 2012) which calls for BBG to, "initiate the deployment of the SW sun-setting strategy developed during the first year of *The Plan*." This simply confirms the budget slashing moves away from shortwave and into brokered local AM/FM broadcasts, Internet streaming, pod-casting and social networking.

The report was authored by André Mendes, director of engineering and technical services for the International Broadcasting Bureau, who insisted, in a response published in *Radio World Online*, that "Shortwave will remain an important medium for the BBG where it is a viable one, but its use will be driven by audience habits and the relative costs of transmission." He reports that, with regard to shortwave broadcasts to China in Mandarin, the audience was estimated to be only one percent of the population (a scant 13 million listeners). No survey methodology in arriving at this number is referenced in the report.

Among the more interesting aspects of the report is the switch to "interactive" media from the traditional one-way broadcasting of shortwave. "Audiences today want to give their feedback and generate their own content," the report notes. Another aspect is the changing global demographics of media users. For instance, people aged 15-24 in Indonesia, China and Vietnam who were asked, "Which communications channel could you not live without?" Across the board only one percent said radio, according to the report. Again, no survey methodology is given.

The Plan includes sweeping technology

changes in great detail, including adoption of cloud computing, MPEG4 HD technology for its satellite feeds; advice on proper cabling of routers and the use of "virtual sets," blue-screen backdrops that allow producers to customize news desks and studio backgrounds (including "virtual plants") at very little expense.

The report is highly critical of staff in all directions at one point citing "blurry lines of responsibility, finger pointing, morale issues and lower overall performance" under the sub-heading "Organizational misalignment, dysfunction, and behavioral issues." Heads will roll.

It's easy to see why this document was under wraps for so long. It doesn't paint a flattering picture of an important tool of U.S. statecraft, but it's difficult to see what the result of this plan will be. No doubt many entrenched supporters of shortwave will find sympathetic ears in Congress who will miraculously find the funding to continue many projects this report was designed to kill.

RNW Budget Slashed (Again)

Andy Sennitt reports on his blog (<http://blogs.rnw.nl/medianetwork>) that government cuts to Radio Netherlands Worldwide (RNW) will leave the RNW International budget with one-quarter of its previous funding. "The new plans outlay a shift in focus towards providing news and information to regions where press freedom is limited. Dutch-language programming would be largely scrapped, keeping only RNW's function as an emergency broadcasting station in the event of disasters for Dutch nationals abroad."

AM/FM/TV BROADCASTING

Cord-Cutters Growing/Shrinking?

Two surveys out this past spring tried to quantify the question of cord-cutting, the fanciful term given to cancelling cable and satellite-TV subscriptions: Is it happening or not? A Consumer Electronic Association (CEA) survey released at the end of June indicated that only 10 percent of those surveyed planned to "cut the cord" to their cable or satellite TV service and pegged the total number of U.S. households relying solely on Over-the-Air (OTA) TV at eight per cent, a declining trend, according to the CEA survey.

But, a competing survey from the Knowledge Network, cited in a March 15 article in *Ad*

Age Mediaworks, indicated that 17 percent said they had already cut back or eliminated cable or satellite TV service and further put the number of OTA households at 15 percent, a substantial discrepancy.

The CEA survey dismissed reported increases in OTA antenna sales as simply not happening, insisting instead that, "The cord that's being cut is the one to the antenna." The CEA is a supporter of the FCC push to ask OTA TV stations to vacate their assigned spectrum to allow a new wireless TV industry to take over.

Another bit of related information is also of interest. An article in the *New York Times* from May 3 reports that for the first time in 20 years, ownership of TV sets in the U.S. has declined. The article cites the never-ending recession and high-tech platform switching as possible reasons. Households barely holding on under current economic conditions are unlikely to replace broken TV sets and many young people are using high-tech alternatives such as iPads, smart-phones, and laptops to watch free online streaming instead of over-the-air, cable or satellite TV.

States Gunning for Big Bird

With tax revenues down across the nation, state legislatures are cutting budgets across the board. A popular target is public broadcasting. Often forgetting the educational aspects of such enterprises, which few if any commercial broadcasters would want to undertake, state support for public broadcasting has never been lower.

Florida's governor cut all state funding for all public broadcasting (saving \$4.8 million out of that state's \$69 billion budget).

After Virginia's legislature approved less money for its public broadcasters, Virginia Governor McDonnell used his line item veto to slash additional funds for cuts of nearly \$1 million over the previous budget.

Wisconsin's legislature applied a 10 percent cut to all state agencies including that state's public broadcasting, but then took an extra half-million dollars away from Wisconsin Public Broadcasting as if to emphasize the point.

South Dakota's legislature cut that state's agencies 10 percent across the board, but hacked more than 16 percent from South Dakota Public Broadcasting's budget.

After 43 years on the air, New Jersey Network, that state's public broadcaster, will essentially be closed. The state's governor announced June 6 that the network's 130 employees will be laid off and its headquarters in Trenton shut down. The state will sell the network's radio licenses to Philadelphia and New York public radio stations. New York's current state budget proposes a 10 percent cut to that state's public broadcasters.

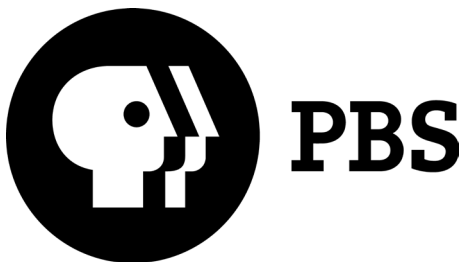
Georgia Public Broadcasting took a 12.3 percent hit while the average state agency would see 7 percent reduction; Louisiana's legislature is cutting 20 percent of that state's public broadcasting budget. Texas, Kentucky, and California have also seen big cuts.

PBS TV Stations Cashing Out

Reductions in state funding are not the end of PBS's woes. Major PBS-TV stations around the country are leaving the Public Broadcasting System and in some cases selling out, cashing in their licenses to religious broadcasters.

WMFE-TV "Public Media for Central Florida," the PBS affiliated TV station in Orlando, Florida for the last 45 years, sold its TV station to Texas-based religious broadcaster Daystar for a reported \$3 million. According to the station's website, the funds would be put in a trust to continue "broadcasting news and information offerings on WMFE's NPR-affiliated radio station on 90.7 FM."

WMFE-TV cited a decline in "corporate and viewer support; uncertainty about state and federal funding; and expected increases in PBS dues and programming costs." Visitors to WMFE-TV's website are directed to WUCF-TV, at the University of Central Florida, also in Orlando.



Longtime PBS affiliate KCET-TV Los Angeles, California sold out to the Church of Scientology for undisclosed terms, according to an article in *Variety*, the entertainment industry trade journal. The station's prime real estate (4.5 acres on Sunset Boulevard, no less!) had ties to "showbiz dating back to 1912," according to *Variety*. In a statement, the Church said it would establish, "one of the most advanced centers used by religious broadcasters with the ability to harness 21st century broadcast technology and production power to deliver its message to the largest international audience possible." KCET plans to continue operations as a non-PBS independent, non-commercial TV station.

An article in the *New York Times* noted that WTTW-TV, Chicago's flagship PBS affiliate, has considered leaving PBS, citing increased dues and decreases in funding. The article quoted a station official as saying they paid \$4.5 million per year in dues to PBS. The article mentioned that the Waco, Texas PBS affiliate closed last year for financial reasons and that there are a half-dozen other stations in a similar predicament.

FCC ENFORCEMENT

CB Shop Cited for Amps and Mods

On November of last year an undercover agent for the FCC paid a visit to the Spark Gap CB Shop in Lincoln, Illinois, shopping for linear amplifiers, and the agent was shown a display case with models from several manufacturers.

The store employee helpfully advised the agent to also purchase a 10 meter amateur radio transceiver that had been modified to operate in the 11 meter Citizens Band.

That earned the shop a Citation with the warning that the FCC could impose a fine of up to \$16,000 for each violation or each day of a continuing violation and up to \$112,500 for any single act or failure to act, should the citation not be taken seriously.

Beauty School Cited for Jamming

If you're running a school, it's hard to get students to set their phones down long enough to learn anything. To get around that problem, the operator of a beauty school in Yakima, Washington installed a cell phone jammer and all was apparently quiet until FCC agents showed up with direction finding devices and determined that signals jamming cell phone frequencies were coming from somewhere in the school. The proprietor admitted to operating a cell phone jammer and shut it off when confronted by FCC field agents.

Communications is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) from clippings and links supplied by our readers. Many thanks to this month's fine reporters: Anonymous, David Alpert, Rachel Baughn, Bob Grove, Norman Hill, Steve Karnes, Brian Rogers, and Larry Van Horn.



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U.S. Coast Guard Search and Rescue demonstration off Los Angeles coast. (U.S. Coast Guard Photo by Coast Guard Petty Officer 1st Class Adam Eggers)

Monitoring Disaster Communications

By Chris Parris



It certainly seems as if barely a week goes by without some sort of weather or other disaster making news headlines. With all of the catastrophes, both man-made and natural, that have befallen different areas of the globe these days, have you ever wondered about monitoring the radio traffic in one of these stricken areas? What if you find yourself in a major storm or other disaster? I was pondering that very question while watching recent news coverage.

If you're deep in the center of a major catastrophe, communications monitoring may not be the first thing you need to worry about. But, if you are otherwise safe, monitoring what is going on around you can provide a wealth of information that you may not be able to get by any other means. While over-the-air broadcasters will have emergency power and some backup transmission systems, cable television, cell phone and Internet services are most likely going to be disrupted for some time after a major disaster.

Listening for the Worst

It goes without saying that it's always a good idea to be prepared, even when it comes to monitoring a disaster. I won't attempt to advise you on how to prepare for your personal safety in emergencies, as there are plenty of experts that can help you with those. But, there are some items you might consider for your emergency communications set-up that will help you hear what's going on in case of a disaster.

Your emergency kits should include extra scanner batteries or a battery backup system for your monitoring equipment, spare antennas and portable AM/FM radios. Portable TV sets will no longer get you much, unless you have one of the new, small digital TV models. And don't forget a VHF weather radio. Even in a non-weather emergency, critical information can be broadcast by local government agencies over the VHF frequencies commonly used for weather forecasts.

So, what frequencies should you listen to in an emergency? Local police, fire and public safety radios should be the most active for immediate information; however, local communications infrastructure may be subject to failures, depending on the type and severity of the disaster that has occurred. Even with advanced planning and backup power sources, some public safety radio systems go down during emergencies due to unforeseen failures. When these radio systems do fail, particularly in the case of a trunked radio system, be sure and watch for instances of "fail-soft."

When a trunked radio system site has no data connection with the master site controller computer, the site can revert to a "site-trunking" mode, in which it can do limited trunking on the available channels at that site. Or it can go into a "fail-soft" mode, where it becomes one or more conventional repeaters using the same frequencies that the trunked radio site would use. If one were only listening to the system as a trunked system, you would miss any traffic that might be using the site in fail-soft.

If your local public safety trunked system fails, check the licensed frequencies for repeaters operating in the "fail soft" mode, as conventional repeaters. Also, keep an ear open for some trunked system frequencies being used in simplex mode as well.

Interoperability Inability

One of the big catch phrases lately in public safety communications has been "Interoperability," the ability of many different agencies with different communications systems to talk to each other during major disasters. Reports from the recent tornados in Joplin, Missouri indicated that the regional public safety radio system op-

erated continuously during the emergency, and users were well trained in interoperability communications. On the other hand, the destructive tornadoes that hit the Tuscaloosa, Alabama area destroyed not only the main communications towers for the area, but also their Emergency Management facility.

As documented in past articles in *Monitoring Times*, there can be a definite lack of training as to the use and availability of these interoperable systems. In emergencies, both large and small, different public safety responders sometimes don't know what channel other agencies or communities are using or how to talk to each other. Disaster training and communications drills attempt to solve that problem, but in an emergency or radio system failure, you may come across agencies using unusual or previously unheard frequencies in an attempt to establish contact with each other.

Amateur radio nets will be very important during disasters, but may also be subject to power or antenna system failures. However, amateur stations are often geared towards emergency operations. Amateur HF nets will operate as well as VHF/UHF local repeaters, so be sure to search for local "SKYWARN" and other emergency operations on the air.

Many municipalities operate an Office of Emergency Management (OEM) agency of some sort; so don't forget to check out your local government channels for their operations. Often the OEM will have local amateur radio operators based in their emergency operations centers. There are almost always some state-level Emergency Management agencies that will be in operation as well. Most states also operate an HF disaster communications network, and many of these agencies have drills or weekly communications tests that you should watch for.

Listening for the Feds

Let's say the emergency happens: earthquake, floods, severe storms, tornados – take your pick. During the actual disaster your primary concern is staying safe. There may not be too much communications activity while officers and firefighters in the field hunker-down and try to survive whatever is going on. Once the immediate danger has subsided enough for first responders to go out in the field and assist victims, then the first wave of communications activity should start in the immediate wake of the disaster.

Many areas have volunteer search and rescue (SAR) operations that will be activated



Minnesota National Guard deployed this Remote Communications Platform to the Moorhead (Minnesota) area. It provided extended communications capabilities to emergency response personnel and was operated by Air National Guard members through a joint mission in support of this year's Red River flood response. (Courtesy: Minnesota National Guard)

during disaster operations. In an emergency, agencies will start handing out radios to staff members, volunteers, etc. There may be channels in these radios that have never been heard locally before.

After the initial activities by the first responding agencies, watch for a "second wave" of agencies arriving to provide assistance. News organizations, support and supply operations, emergency utility crews and federal agencies most likely will show up after the initial disaster has played out. Some of the federal agencies that will work in recovery efforts include Health and Human Services (HHS), the Environmental Protection Agency (EPA) and the Army Corps of Engineers.

The Civil Air Patrol and National Oceanographic and Atmospheric Administration (NOAA) aircraft may be present doing survey and photoreconnaissance work. The Federal Emergency Management Agency (FEMA), part of the Department of Homeland Security, will play a big role in major disaster recovery. Coast Guard assets will also be active, not only in coastal areas, but they have been known to respond to any areas needing assistance.

Along with the second wave, there will be temporary communications systems brought in to cover areas where the normal infrastructure has failed: portable cell sites, trunking sites, satellite terminals to provide phone and Internet service. Some agencies may be using mobile satellite terminals for vehicles, such as the SkyTerra system I described in the September 2010 edition of the *Fed Files*. These satellite systems are all proprietary digital and cannot be monitored.

If you do get a chance to monitor things after a major disaster, you may experience an interesting phenomenon that has been noted by scanner listeners. After a major destructive storm has passed, the airwaves can seem extremely quiet, that is, much less noise in the radio spectrum. Many RF noise-generating devices will be out of service due to power failures. Listeners have described instances of being able to hear clear radio signals from much further away, due to the uncluttered airwaves.

Look for the National Guard to show up on all sorts of frequencies. Listeners of the recent hurricane recovery efforts have noted army guard communications in the VHF lo-band (30 MHz-88 MHz), VHF hi-band (138 MHz -150 MHz), and even the military UHF land-mobile channels (380 MHz - 400 MHz). They may also be using state operated conventional or trunked radio systems if they are available.

Red Cross relief operations have been noted after many recent disasters. The Red Cross low band channel (47.420 MHz) is still active in many places, but be on the lookout for them on conventional UHF frequencies or even business trunked radio systems, if they are still in operation. Remember that privately owned radio systems often do not have the power backups that public safety radio systems do.

Air traffic will definitely be a monitoring target as part of this second-wave of response. Not only will there be all sorts of federal and military air operations, but media helicopters, air ambulance services and even FedEx and UPS special flights carrying supplies and medicines. FAA air traffic control may be operating with

portable towers and temporary frequencies. Sometimes temporary helicopter landing areas will be established with their own dedicated operating frequencies. Careful monitoring of area FAA air traffic channels will often reveal new frequencies being assigned for disaster area operations.

Don't forget to search your local utility companies' radio channels *before* a disaster strikes. Keep those channels handy as you can gain a lot of information during cleanup efforts as to where outages are and where repair crews are operating. In many large disasters, utility crews from outside areas are brought in for recovery and cleanup work. They may operate on simplex channels that are provided by your local utility companies as well.

Disaster at a Distance

What about monitoring events occurring at a distance? If the affected area that you are monitoring is less than 100 miles or so away, you should still keep an ear on VHF and UHF land-mobile channels. Mutual Aid response can come from areas all around the stricken region, so you may hear related communications even at some distances. Inbound aircraft will easily be heard talking with air traffic control and even call in to stations at their destinations prior to landing.

In addition to monitoring radio communications with your own receiving equipment, there are ways to monitor disaster communications over the Internet. Police and other public safety radio communications are increasingly being streamed over various Internet services that allow

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- *Manual selection for channel.
- *Scan mode. [Cleared channels (000.000 freq.) are not scan.]
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you to listen to scanners located in many different cities around the country. In some cases these feeds are available via smart phone applications that can be downloaded and played on your cell phone. These feeds can also be accessed via your computer, even your iPad, through your Internet connection.

So what about a frequency list? This is something that you should put together ahead of time, as part of being prepared for a disaster. When the lights go out, looking up frequencies on line is not going to happen, so you should have a paper version of your disaster frequencies available for reference and know how to program these frequencies into your scanner if you haven't done so in a while.

Start with your local public safety channels, with which you are probably already familiar. Besides your police and fire departments, research frequencies for your local utilities and local government agencies. I have programmed the frequencies for various companies that provide power, water, gas and such to my area. I don't normally scan these frequencies daily, but they are handy to have in case something comes up. If you are fortunate enough to have more than one scanner available, keep the common, nationwide channels listed below in one scanner, and utilize the other to search out some of the listed frequency search ranges.

Here is a list of frequencies you should scan in case of any major incident or disaster in the area. In addition to these, search out previously unknown channels and stay safe!

NATIONWIDE INTEROPERABILITY CHANNELS

LLAW1 39.4600 / 45.8600
LFIRE2 39.4800 / 45.8800
LLAW3 45.8600 / 39.4600
LFIRE4 45.8800 / 39.4800

VCALL10 155.7525
VTAC11 151.1375
VTAC12 154.4525
VTAC13 158.7375
VTAC14 159.4725
VTAC17 161.8500 / 157.2500
VTAC33 159.4725 / 151.1375
VTAC34 158.7375 / 154.4525
VTAC35 159.4725 / 158.7375
VTAC36 151.1375 / 159.4725
VTAC37 154.4525 / 158.7375
VTAC38 158.7375 / 159.4725

UCALL40 453.2125 / 458.2125
UTAC41 453.4625 / 458.4625
UTAC42 453.7125 / 458.7125
UTAC43 453.8625 / 458.8625

800 MHz National Mutual Aid (after 800 MHz Rebanding)

8CALL90 851.0125 / 806.0125
8TAC91 851.5125 / 806.5125
8TAC92 852.0125 / 807.0125
8TAC93 852.5125 / 807.5125
8TAC94 853.0125 / 808.0125

800 MHz National Mutual Aid (before 800 MHz Rebanding)

8CALL90 866.0125 / 821.0125
8TAC91 866.5125 / 821.5125
8TAC92 867.0125 / 822.0125
8TAC93 867.5125 / 822.5125
8TAC94 868.0125 / 823.0125

Each state also has some individually assigned 800 MHz common channels.

FEDERAL INTEROPERABILITY CHANNELS

NC 1 169.5375 / 164.7125
IR 1 170.0125 / 165.2500
IR 2 170.4125 / 165.9625
IR 3 170.6875 / 166.5750
IR 4 173.0375 / 167.3250
IR 5 169.5375
IR 6 170.0125
IR 7 170.4125
IR 8 170.6875
IR 9 173.0375

NC 2 410.2375 / 419.2375
IR 10 410.4375 / 419.4375
IR 11 410.6375 / 419.6375
IR 12 410.8375 / 419.8375
IR 13 413.1875
IR 14 413.2125
IR 15 410.2375
IR 16 410.4375
IR 17 410.6375
IR 18 410.8375

LE A 167.0875
LE 1 167.0875 / 162.0875
LE 2 167.2500 / 162.2625
LE 3 167.7500 / 162.8375
LE 4 168.1125 / 163.2875
LE 5 168.4625 / 163.4250
LE 6 167.2500
LE 7 167.7500
LE 8 168.1125
LE 9 168.4625

LE B 414.0375
LE 10 409.9875 / 418.9875
LE 11 410.1875 / 419.1875
LE 12 410.6125 / 419.6125
LE 13 414.0625
LE 14 414.3125
LE 15 414.3375
LE 16 409.9875
LE 17 410.1875
LE 18 410.6125

MISCELLANEOUS NATIONWIDE EMERGENCY FREQUENCIES

40.5000 Military Joint Common "FM"
47.4200 Red Cross national assignment
121.5000 Aircraft emergency "VHF Guard"
123.0250 Helicopter common
123.0750 Helicopter common
123.1000 Aircraft Search & Rescue common
148.1250 Civil Air Patrol
148.1500 Civil Air Patrol
155.1600 Search & Rescue – common in many areas
155.3400 Medical Emergency – common in many areas
155.4750 National Law Enforcement Common
156.8000 Marine Channel 16
157.0500 Marine Channel 21A
157.0750 Marine Channel 81A
157.1000 Marine Channel 22A
157.1250 Marine Channel 82A
157.1500 Marine Channel 23A
157.1750 Marine Channel 83A
163.1000 Federal Agencies
164.4500 EPA Common
166.4625 Federal Agencies
168.3500 Federal Agencies
168.6250 US Forest Service Aviation "Air Guard"
168.6500 US Forest Service Aviation "Flight Following"
243.0000 Aircraft emergency "UHF Guard"
282.8000 Joint military search & rescue common
406.8625 National Disaster Medical System (NDMS)
407.1250 Disaster Medical Assistance Teams (DMAT)

407.2625 National Disaster Medical System (NDMS)
407.4625 National Disaster Medical System (NDMS)
409.0000 Disaster Medical Assistance Teams (DMAT)
409.0500 Federal Agencies
409.0750 National Disaster Medical System (NDMS)
409.3375 Federal Agencies
409.4625 National Disaster Medical System (NDMS)
412.8250 Federal Agencies
412.8375 Federal Agencies
412.8500 Federal Agencies
412.8625 Federal Agencies
412.8750 National Disaster Medical System (NDMS)
418.0500 Federal Agencies
418.3375 Federal Agencies

NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION WEATHER BROADCASTS

162.375 National Weather Service
162.4 00 National Weather Service
162.425 National Weather Service
162.400 National Weather Service
162.475 National Weather Service
162.500 National Weather Service
162.525 National Weather Service
162.550 National Weather Service
162.575 National Weather Service

SUGGESTED FREQUENCY SEARCH RANGES FOR DISASTER COMMUNICATIONS

30 to 88 MHz - National Guard and military FM
138 to 144 MHz - National Guard and military AM/FM
144 to 148 MHz - Amateur "2-Meter" band
148.0 to 150.75 - National Guard and military
150.8 to 161.59 MHz - Power, water, gas utilities and public safety VHF radio systems
161.640 to 161.760 MHz - News Media, both local and national
222 to 225 MHz - Amateur "1.25 Meter" band
380 to 400 MHz - National Guard and military
420 to 450 MHz - Amateur "70-Centimeter" band
450 to 451 & 455 to 456 MHz - News Media, both local and national
451 to 469 MHz - Power, water, gas utilities and public safety UHF radio systems
462.95 to 463.175 & 467.95 to 468.175 - UHF Medical Nets

DISASTER FREQUENCY RESOURCES

Check these out BEFORE an emergency strikes.

The National Interoperability Field Operations Guide, a must have:
www.ncdhhs.gov/dhsr/EMS/pdf/NIFOG.pdf

Radio Reference on line frequency database, for your local frequency information:
www.radioreference.com/apps/db/

Radio Reference also has a page devoted to compiling monitored frequencies from various events and disasters:
http://wiki.radioreference.com/index.php/Major_Events_and_Disasters

Salvation Army Team Emergency Radio Network (SATERN) HF, VHF and UHF frequencies by operating region.
<http://www.satarn.org/>

Chris Parris writes the Fed Files column for MT and may be reached at chrisparris@monitoringtimes.com



Weird World of Antennas

By Mark Haverstock K8MSH

There has always been something magical about antennas with their ability to transmit and grab invisible signals out of thin air. Old school antennas used to be standard – the expected shapes and sizes, such as Yagis and corner reflectors populating the rooftops for TV reception. Portable FM radios always had a telescoping antenna built into the case.

Today, antennas are cropping up in all kinds of shapes, sizes and forms. The vertical whip on vehicles is giving way to in-glass antennas and sharkfin shaped roof fixtures. Giant antennas sprout all over the landscape in the form of cell towers. Others disappear into the background or are hidden among the electronics. Remember when cell phones actually had visible antennas?

Welcome to the weird new world of antennas, where antennas can look like or be just about anything.

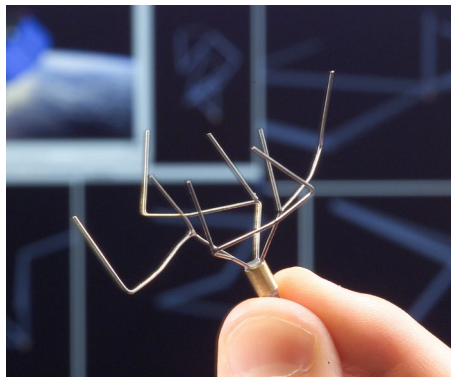
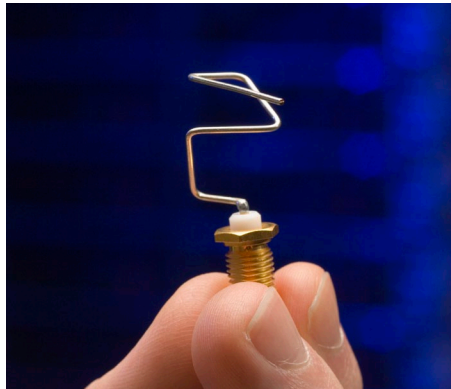
Bent Paper Clips?

This strange looking antenna on the NASA ST5 micro satellite antenna doesn't require a matching network and provides 2-4 dB of gain with more uniform coverage. Able to fit into a one-inch space (2.5 by 2.5 centimeters), the antenna can receive commands and send data to Earth from the Space Technology 5 (ST5) satellites.

The three satellites, themselves no bigger than an average TV set, help scientists study magnetic fields in Earth's magnetosphere. NASA scientists spent two years developing the evolutionary artificial intelligence (AI) software that designed the antenna, based on a LOGO-like language (remember LOGO?).

"The AI software examined millions of potential antenna designs before settling on a final one," said project lead Jason Lohn, a scientist at NASA's Ames Research Center, located in California's Silicon Valley. "Through a process patterned after Darwin's 'survival of the fittest,' the strongest designs survive and the less capable do not."

The software started with random antenna designs and, through the evolutionary process, refined them. The computer system, composed of 120 personal computers working as a team, took about 10 hours to complete the initial antenna design process. "We told the computer program what performance the antenna should have, and the computer simulated evolution, keeping the best antenna designs that ap-



ST5 Antenna from evolutionary AI software—only the strong survive. (Photo Credit: NASA Ames Research Center)

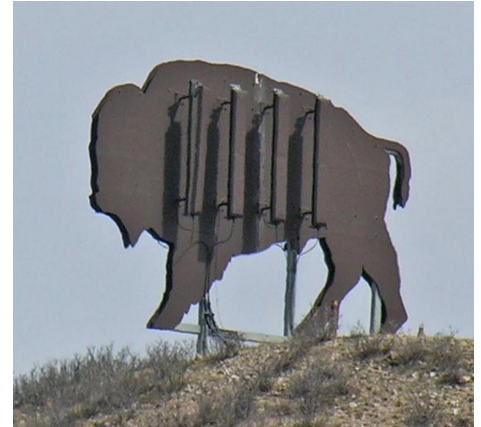
proached what we asked for. Eventually, it zeroed in on something that met the desired specifications for the mission," Lohn said, adding, "Not only can the software work fast, but it can adapt existing designs quickly to meet changing mission requirements."

Where the Buffalo Roam

In some instances, cell phone companies have gone to great lengths to make their antennas blend in with the surroundings. This antenna on I-25, south of Cheyenne, Wyoming was constructed by the Mountain Wireless Construction Company of Aurora, Colorado.

The 12-foot long bison figure is made of marine plywood and was built in their shop. But, upon completion, they found it was too big to fit through the door. A few alterations and some brute strength eventually got the animal silhouette out the door and onto the hilltop.

The antennas belong to Verizon Wireless and the bison and the cell site are named "Pipeline," after an oil pipeline buried beneath.



Cellular antennas hidden behind a plywood bison. (Photo Credit: MountainWireless.com)

A Higher Calling

Pastor Douglas Fountain of Epiphany Lutheran in Lake Worth, Florida, wasn't sure he wanted a cell phone tower on the church property. But when T-Mobile told him they



It calls people to the church—and people can make calls as well. (Photo Credit: It 1224/ Wikipedia)

could make the tower look like anything he wanted, he saw an opportunity. According to the church's executive director, John Sasson, T-Mobile hid antennas and equipment inside the 100-foot-high cross, which spans 30 feet, making it the largest freestanding cross in the Southeast.

Sasson says the cross provides "advertising we would not have been able to afford," as well as some additional income. T-Mobile is leasing some of the church's property for the antenna space.

Who's Fooling Whom?



Can you find the Antenna? (Photo credit: Gary Minnaert/Wikipedia)

Putting palm leaves on this cell tower is like putting a bad toupee on a bald guy. Sure, they want the antenna to be aesthetically pleasing and blend in – but this has to be one of the homeliest and most unrealistic looking trees around. This example of almost antenna camouflage was found in Tucson, Arizona.

The Tree is the Antenna

Pictured is a tree antenna. It's not a sup-port, but actually an antenna for 600 meter VLF, thanks to the work of Ralph Hartwell W5JGV, a long-time broadcast engineer. There are two methods generally used to connect to a tree for using it as an antenna. The first is to drive a nail into the tree some distance up from the ground, and the second is to use a coupling coil around the trunk close to the ground. Hartwell preferred not to climb trees so he decided that the coupling coil would be the better approach.

Since little, if any, design data has been published on tree antenna coupling coils, he took a guess at what might work for the coil dimensions. "I guesstimated that using a coil with about half the diameter of the tree trunk would be about right for the coil diameter," he explains. "The length of the coil would be



the diameter of the tree trunk. The number of turns was an unknown, but I figured that if the inductance was too small the tuning would be very sharp, and changing environmental conditions, rain, temperature, etc., might cause tuning problems. A larger inductance would be less sensitive to such things."

Designing the coil was one thing, but holding it in place against the tree presented a problem. It had to be held away from the bark, or losses would increase when the tree got wet in the rain. "I finally hit on the idea of dropping each turn of the coil into a series of parallel slots cut into a length of plastic pipe," he says. Hartwell added a matching network (inside the gray box) and a ground system to complete the antenna. Detailed plans with photos can be found at:

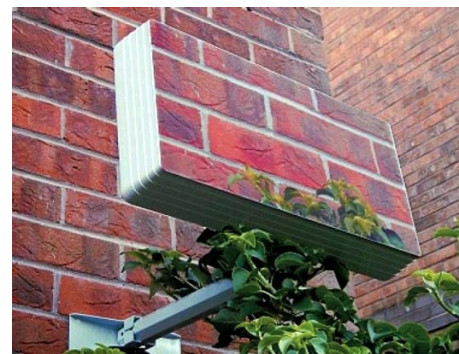
http://w5jgv.com/tree_antenna/index.htm

Tree antennas aren't a new idea. These antennas were routinely utilized during the Vietnam War. And, General George O. Squire wrote about them in *Scientific American* in 1919. Link: http://w5jgv.com/tree_antenna/George%20O%20Squire%20Tree%20Antenna%20Patent.pdf

Hartwell recommends several other links to help grow your interest in tree antennas. "Trees Performing as Radio Antennas" http://w5jgv.com/tree_antenna/1975%20January%20Ikrath%20IEEE%20tree%20antennas.pdf "Trees as Antennas" http://w5jgv.com/tree_antenna/Robert%20Hand.pdf; and "Signal Propagation at 400 kHz Using an Oak Tree with a HEMAC as an Antenna" <http://w5jgv.com/downloads/AD735330.pdf>

Undercover Satellite

Once the novelty of a satellite dish has worn off, it's just a big, ugly hunk of metal or fiberglass on your house. The Sqish, a rectangular wall-mounted dish, has addressed this issue in an unusual way – when you order your dish, you send in a picture of your wall,



Satellite dishes blend in like a chameleon. (Photo Credit: Squish.co.uk)

and they send you a "sqishoflage" sticker to help it blend in with its surroundings. These UV-stable, matte finish stickers cost an extra £25, and they provide three color tone variations for a better match.

The 48cm by 26cm plastic Sqish antenna unit is just 7cm deep, and can receive Sky and Freesat in the UK, but aren't available in the U.S. at this time. It's mounted on a multipurpose bracket that allows 90 degree clearance.

OK, so it's not exactly invisible, but the Sqish is certainly useful for homes in areas where regulations restrict the choice of sat receivers. It may appeal to those who want access to decent television without the "dish stigma."

Real Rabbit Ears

What's up, doc? Perhaps this vintage cartoon character antenna is up on a television ready to receive Over-the-Hare TV signals. This antenna, made by JFD Electronics, includes two telescoping whips and a loop, each fed with a short length of 300 ohm twin-lead, and of course, Bugs Bunny's toothy mug front and center. According to the box description, it improves performance on VHF channels; UHF channels; FM mono and stereo. We're not sure, but perhaps the carrot might be intended as some kind of matching stub. Digital converter not included. (Photo on following page)

Real Beverage Antenna

A refreshing alternative to the standard two-meter vertical is the soda can vertical dipole.

Unlike the antenna developed by Harold Beverage in 1920, this soda can antenna is omnidirectional rather than unidirectional, and considerably shorter. In addition, it's eco-friendly and a great way to recycle those used soda or beer cans.



Actual rabbit ears antenna (Photo Credit: Keith Schneider, Gasoline Alley Antiques.com)

Eight soda cans are needed, and can be quickly prepared (emptied) at a club meeting, field day, or other social gathering. Four aluminum beverage cans stacked together is comfortably close to the value of a 1/4 wavelength element.

Each can is fastened to the can below it with three sheet metal screws to form the elements. Hex head self-drilling #6, 1/2-inch sheet metal screws are easiest to use, driven by a 1/4 inch magnetic tipped nut driver with a long shaft or shaft extension through the pop-top opening. Conventional sheet metal screws also work, but you may want to drill small pilot holes first. Each element consists of four attached cans.

After the two elements are completed, the tops are removed using circular cutting metal shears. Old-fashioned manual can openers also work well if you don't apply too much pressure. Can assemblies are then joined together at the center of the antenna with a short piece of 1-1/2 inch, schedule 40 PVC pipe. Sand the connection points to the cans to remove outer coating and attach a good quality coaxial feed cable with sheet metal screws tapped into the PVC pipe. A vertical support can be fashioned from some 1 x 2 furring



Yes, you can! (Photo Credit: Author)

strip, PVC pipe, or other insulated material and attached using nylon wire ties.

Monster Arrays - The Woodpecker



Woodpecker Array – the real iron curtain. (Photo Credit: Necator/Wikipedia)

Those of you who were active in short-wave listening and ham radio between 1976 and 1989 remember the Russian Woodpecker – the sharp 10Hz tapping noise that appeared in random frequency hops between 7 and 19 MHz. The interference caused by the Woodpecker resulted in thousands of complaints from legitimate broadcasters and hams worldwide.

Pictured is the massive antenna behind the interference, known as Duga-3 radar array, located outside Chernobyl, Ukraine. Transmit power was estimated to be as high as 10 MW (megawatts) equivalent isotropically radiated power. Pulses transmitted by the Woodpecker had a wide bandwidth, typically 40 kHz.

The purpose of the array wasn't radio

jamming as many speculated. Instead, it was an over-the-horizon (OTH) radar system designed to provide early warning and track missile launches. When more reliable early warning satellite systems became available, the OTH system eventually was shut down.

Others have some more interesting ideas, particularly one about a sinister experiment in global mind control technology. The Woodpecker array was aimed at the west, transmitting on frequencies that supposedly matched the alpha brainwave frequencies.

Control of the earth's electromagnetic field was another alleged use, along with setting off earthquakes and changing weather patterns by bombarding the ionosphere with high-powered radio waves. The same was said of Alaska's HAARP array.

Playing the HAARP

Another monster antenna array is HAARP, an ionospheric research facility located in Gakona, Alaska, about 180 miles northeast of Anchorage. HAARP stands for The High Frequency Active Auroral Research Program. The goal of this program is to further advance knowledge of the physical and electrical properties of the Earth's ionosphere which can affect our military and civilian communication and navigation systems.

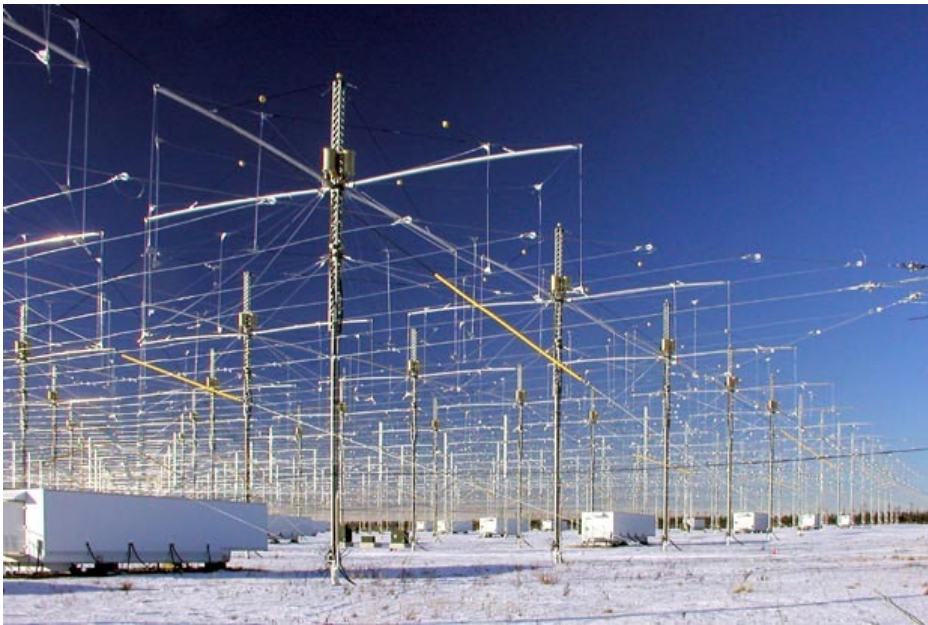
The HAARP antenna array consists of 180 antennas on a total land area of about 35 acres. The array, along with its integrated transmitters, has a total radiated power capability of about 3,600 kilowatts. HAARP transmitters direct signals in the 2.8 - 10 MHz region of the HF (High Frequency) band, into the ionosphere. The signal may be pulsed or continuous. ELF (extremely low frequency) signals are generated in the ionosphere at an altitude of around 100 km. Frequencies ranging from below one Hz to about 20 kHz can be generated through this ionospheric interaction process.

Like the Russian Woodpecker, it is alleged

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Visitors view the 180 antenna arrays at HAARP site in Gakona, Alaska. (U.S. Air Force Research Laboratory)

that HAARP also has hidden agendas and capabilities. The project has been blamed for triggering catastrophes such as floods, earthquakes, droughts, hurricanes, thunderstorms, and major power outages. Conspiracy theorists have also suggested links between HAARP and the work of Nikola Tesla (particularly potential combinations of HAARP energy with Tesla's work on pneumatic small-scale earthquake generation) and physicist Bernard Eastlund.

Their website FAQ section dismisses all these allegations and notes that there are no classified projects on site. Activities and environmental impact documents are a matter of public record. Further information on the site can be found at: www.haarp.alaska.edu

That Sinking Feeling

You've heard the expression, everything but the kitchen sink. During the 2008 KOS Strange Antenna Challenge, Douglas Kohl, KI4YOB, started with the kitchen sink. His first attempt at making contacts using a stainless steel kitchen sink, resting atop a full size metal bedspring, resulted in marginal reception at best and no contacts made for 2 hours. Doug then elevated the setup about 4-1/2 feet off the ground. "Reception was a little better; I made one local contact," he explains, "Signal report from local station: 'barely out of the mud.'"

If you're interested in trying your hand at working stations with your own strange antenna, here are the basic rules: No wire! No pipe! (Unless it is currently part of something else.) If it is metal, you can tune it. Contest is held the last weekend in May, and further details can be found at: www.n0ew.org/k0s/



Douglas Kohl, KI4YOB loads up the kitchen sink over bedspring radial. (Photo Credit: Douglas Kohl KI4YOB)

Point and Shoot

For bow hunters who take their hobby seriously, Double Take Archery offers a really sharp accessory for your car or truck. Arrow Antenna pulls in AM and FM stations along with plenty of double takes. The attention-getting Arrow Antenna is a real fiberglass, camouflage-patterned arrow, but you don't want to put this one on your bow. The housing contains a universal antenna that directly swaps out with the stock antenna on your vehicle. It's designed to work just as well as the original, but with an outdoor flair you won't find anywhere else.



Arrow is working replacement for AM/FM vehicle antennas. (Photo Credit: Double Take Archery, LLC)

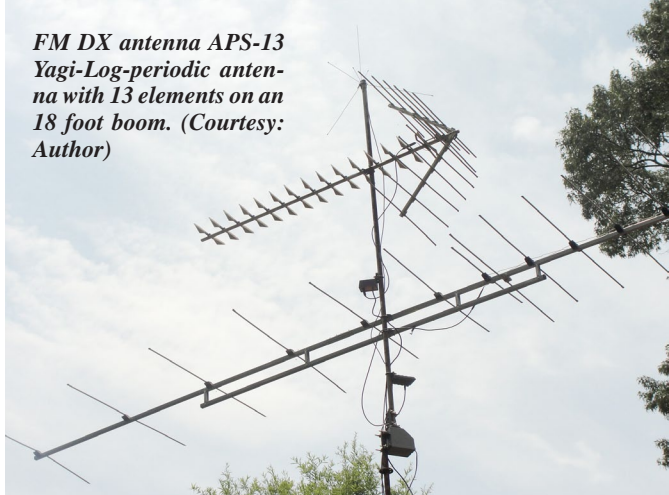


KOS Strange Antenna Challenge (Photo Credit: Erik Weaver N0EW)

DXing the FM Band in a Translator/Booster World

By Ken Reitz KS4ZR

FM DX antenna APS-13 Yagi-Log-periodic antenna with 13 elements on an 18 foot boom. (Courtesy: Author)



The landscape of America's FM band has dramatically changed over the last 10 years and FM DX has been severely hampered. Thousands of new transmitters have cluttered up the once wide open, static-free, high fidelity band to which audiophiles once retreated to hear beautiful music.

In their most recent tally the FCC reports that there are 10,000 commercial and noncommercial FM stations on the band. But, it's also licensed another 7,000 translators, boosters and low-powered FM transmitters, making a total of some 17,000 FM signals crammed into the same 300 channels that make up the 20 MHz wide band (87.9 to 107.9 MHz). On top of that there are several thousand unlicensed FM transmitters, mostly in and around big cities, some of which are pounding out hundreds of watts. It's never been harder to pull in distant FM signals, but the good news is that it's still possible.

Chasing FM DX

The annual FM DX season, generally from April through August, offers many chances for excellent long distance reception via tropospheric and E-layer skip (Es). When the skip is in you don't need any fancy radios or expensive outdoor-mounted antennas, the skip just rolls through, pushing aside your local favorites and introducing you to stations from hundreds and even thousands of miles away. For most FM radio listeners it's a big nuisance, but for FM DXers it's the highlight of the year. This kind of DX you don't have to chase, it comes to you. Everything you could want to learn about Es propagation may be found in "Mid-Latitude Sporadic-E A Review" by Michael Hawk, (<http://www.wtfd.org/images/stories/pdf/sporade.pdf>), found on the Worldwide TV-FM DX Association web site which has a treasure-trove of information and forums on the subject.

Tropospheric ducting is associated with wide-open spaces such as the Great Lakes,

the Gulf of Mexico or the waters between the Hawaiian Islands and the U.S. West Coast. The combination of weather and E-layer skip essentially sets up "ducts" through which radio waves in the FM band (or TV, for that matter) may travel great distances. Chris Kadlec has written a 43 page study of Great Lakes Tropospheric ducting, also for the WTFDA site which you may read here: http://www.wtfd.org/images/stories/pdf/dx_2006_log_report.pdf.

You'll know if you're having Es or Tropo by just tuning your radio, but how can you tell if such skip is in the forecast? Luckily, there are a number of places to see just how favorable such conditions may be in your area. Again, turning to WTFDA you'll find VHF propagation maps that graphically show in real-time where such conditions are occurring and to what extent. The propagation map is found on the WTFDA home page, click on "APRS Map for Real-time Tropo Paths." You can also monitor their real-time FM DX Skip logs as avid FM DXers check in from all over the U.S. to report what they're hearing.

Another spectacularly useful site is www.dxfm.com, run by Girard Westerberg from Lexington, Kentucky. Girard also has a superb tutorial on TV-FM signal propagation, just click on the button labeled "signal propagation." Examples of digital and analog (back in the day) TV images are posted by DXers that show the date and the distance of the DX. TV images from distances in excess of 1,000 miles are not uncommon.

Girard also has many informative articles about analog and digital TV and FM DX. You can spend a lot of time just reading about what's been happening in this hobby for the last few years. While most American's only switched to digital TV two years ago, these guys have been logging DTV signals for ten years. Current FM DX logs are posted on the DXFM home page, just scroll down until you run into "DX Reports from You." One interesting aspect of the logs is that each reporter details his or her equipment

including antenna type and model, height above ground, FM tuner and antenna preamp used as well as location. Reading reports as this is written in mid-June, Es FMDX of 1,000 to 2,000 miles is being reported daily.

FMDX Gear: Receivers:

Receivers for serious FMDXers fall into two camps: old school and new school. There are those in the hobby who swear by vintage, analog-tuned, FM receivers. The Tuner Information Center (www.fmtunerinfo.com) has the most authoritative information about vintage receivers that are also excellent DX machines. Of course, the only place you'll find these receivers today is through specialized forums and e-Bay. But, you might find a good looking vintage FM receiver at a junk shop that you'd like to know more about. If so, check out their member-written reviews by clicking on the brand list at the left on the home page. Exhaustive information from Accuphase to Yamaha, covering over 100 brands and hundreds of models, are examined by pros and hobbyists. Even though some of the information available on this site is dated, their informed opinion is worth noting.

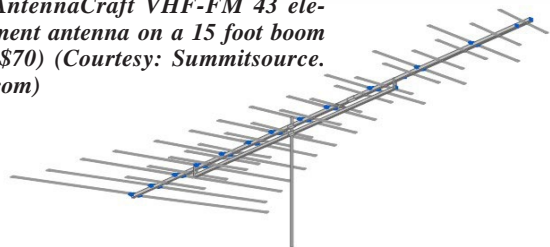


New receivers also fall into two categories: with or without HD-Radio capability. The problem is that HD-Radio has been exceedingly slow to take off and some of the earlier models that FMDXers adopted, such as the Sony XDRF-1HD, are no longer made. Several new FM tuner/receivers have built-in HD-Radio capability and at least one, Onkyo, has an outboard, add-on



Sangean HDT-1X component analog/HD-Radio AM and FM tuner. (Courtesy: Sangean U.S.A.)

AntennaCraft VHF-FM 43 element antenna on a 15 foot boom (\$70) (Courtesy: SummitSource.com)



HD-tuner. That leaves the Sangean HDT-1X, a component AM/FM/HD tuner (about \$200) as the go-to DX machine. Even it has been discontinued by several national retailers including Crutchfield and CCrane, though a spokesperson for Sangean has assured me the unit is still very much in production. I've used one for several years and found it to be a very sensitive FM tuner, though the AM section is not nearly as good as the AM band on my Kenwood TS-140s transceiver. The Sangean HDT-1X features RDS display, external AM and FM antenna inputs and fiber optic as well as RCA stereo audio outputs.

Antennas:

Antenna manufacturers appear to be abandoning the FM band. Antenna Performance Specialties' APS-13, the premier DX FM antenna is no longer available; Winegard has discontinued their 10 element, 13 foot FM antenna, even Antennacraft is no longer making their DX FM antenna. But, you can still get excellent results by using a VHF-low band TV antenna (channels 2-6).

More adventurous FMDXers stack antennas for greater front-to-back gain and to help reduce side-lobe interference. If you stack two identical antennas, one on top of the other, you increase the gain and make it so you don't need a mast-mounted preamplifier. Just make sure the antennas are at least a half-wave length apart to avoid interaction between the two and that the two antennas are joined to an antenna coupler with cables of identical length, in order to avoid the signals from the antennas arriving out of phase.

If you really want to go for broke (literally) you can stack four identical antennas, increasing the gain further and reducing side-lobe interference more. "Quad-stacking," as it is known, is tricky. Typically, one stack will be two antennas one-over-the-other on the same mast (make sure they're lined up the same!), then a wooden boom (to reduce interaction with all the extra aluminum) is placed between the vertical stack and two other identical antennas are secured to each end of the wooden boom, making a diamond-shaped array as seen on-end. These must all be fed with coax cable cut as close to

the same length as you can in order to avoid the signals getting out of phase.

If you're using four six-element antennas, which I have done, you end up with a 24 element super-array that brings in solid signals from 60-80 miles away, no skip or mast-mounted preamp necessary. But, there's a problem, as I discovered over the winter: You have to

make the structure is as solid as you can make it because the first ice storm that comes your way will reduce your fabulous array to scrap.

By this time you've got quite a lot of metal and wood on the mast and you'll need to consider getting a heavy duty rotator. The average TV rotator is just not going to be up to the task. If you want to try a quad-stack with something bigger than four six-element antennas, you need to really map out your structure and rotator strategy as well as paying attention to how much space such an array needs to swing 360 degrees. Nearby tree branches can beat your array to scrap in a wind storm.

Top FMDXers use a combination of antennas (a large DX FM antenna and a smaller FM antenna on a separate but nearby rotatable mast) to null out signals from nearby FM stations to let distant FM stations come through. This set-up requires being able to deftly rotate both the DX antenna and the "noise antenna" so that the combined signal nulls out the interfering nearby FM station.

Preamps, Rotators, and Cable

Mast-mounted antenna preamplifiers are a must for serious FMDX antennas. Make sure the one you get is intended for the VHF-TV band. Some preamps cover only the UHF-TV band. Use RG-6 coax cable from the antenna to your receiver. This is the same cable used for satellite TV and it is heavily shielded with a good copper



Channel Master 7778 mast-mounted preamplifier (\$51). (Courtesy: SummitSource.com)

<http://www.dxfm.com>

Girard Westerberg's highly informative FMDX site includes recent loggings from TV and FM DXers as well as current solar and geomagnetic activity and conditions.

<http://www.wtfda.org>

The premier site for everything having to do with FM DX has great archive of related articles; authoritative forums; maps of real-time E-skip and Tropospheric paths as well as current loggings from serious FMDXers.

<http://dxworld.com/tvfmlog.html>

Direct link to real-time TV and FM DX loggings.

<http://transition.fcc.gov/mb/audio/fmq.html>

Official FCC records of every AM and FM station licensed in North America and the Caribbean lets you find out how much power they're running and the exact location of their antennas.

<http://fmdx.usclargo.com>

Mike Bugaj's TV and FM DX page is packed with technical resources for the FM-TV DXer including reviews of popular FM receivers and tuners.

www.summitsource.com (866-637-4965)
<http://www.starkelectronic.com> (508-756-7136)

Two great mail-order sources for brand name TV and FM DX gear. Both carry DX antennas, preamplifiers, rotators, cable and more.

<http://www.distancefromto.net> (measure the DX yourself)

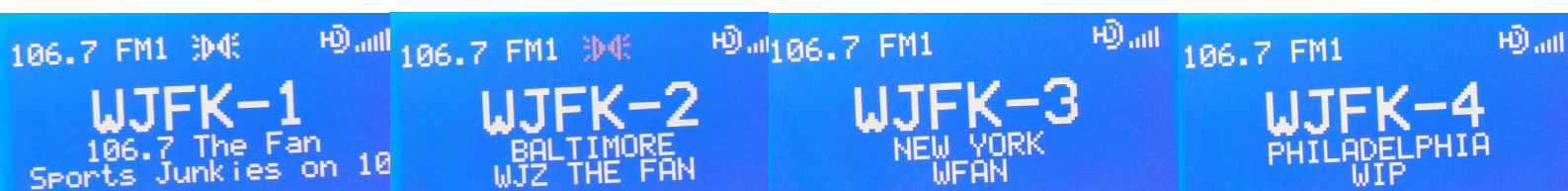
Quickly learn the distance between your home and the DX station.

www.fmfool.com

Shows what stations are receivable under normal conditions at your location given your antenna height.

conductor. Look for cable with a heavy copper ground wire attached that will help ground your antenna. Many Radio Shack stores no longer carry outdoor FM antenna equipment of any use to FMDXers, nor do many big discounters such as Walmart or Lowes. But, you can find the suitable gear still available at the two mail-order retail stores listed in the resources.

Depending on your DX antenna, consider shopping for a smaller amateur radio rotator instead of a generic TV rotator. But, whichever you chose, be sure to get the correct cable to go from your rotator-controller to the rotator. Some use three or five conductors, others send the voltage up through the coax, similar to the way LNBF voltage is fed in a satellite-TV installation.



RDS display from a Sangean HDT-1X shows reception of pioneering HD-Radio FM station WJFK (Manassas, Virginia). In addition to their own lineup of D.C.-related major league sports on WJFK-HD1, they also re-broadcast WFAN, (New York), WIP (Philadelphia) and WJZ (Baltimore). HD icon indicates full HD reception. (Courtesy: Author)

Reading MT on the iPad

By Gordon Bousman NW7D
(Photos courtesy Ken Reitz KS4ZR)

Having been a long-time, avid reader of *Monitoring Times*, I had always yearned for a better way to read one of my favorite magazines while traveling; I fly about 200,000 miles per year for my employer. Then, last Christmas, Santa Claus delivered both an iPhone™ and an iPad™ to me and, while the initial purpose was to enhance my productivity while working (email, document reading, etc.), I soon discovered that the iPad is also an excellent substitute for the more commonly known e-readers such as Nook™ and Kindle™ for reading books and magazines. Storage of books or magazines is the same on either platform; it's just smaller on the iPhone.

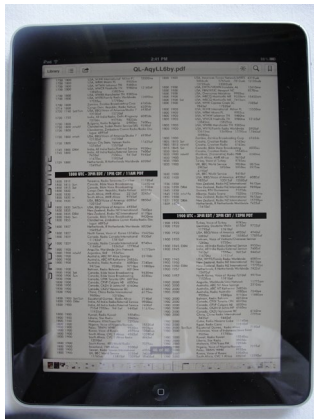
In fact, the iPad does an excellent job of storing these books and magazines in memory, which eliminates the accumulation of piles of paper magazines and books, so it's very environmentally friendly in that respect. In years past, if I wanted to read *MT* or other magazines/books while traveling, it meant adding weight and bulk to my briefcase. Now, I only need to carry my 1.33 pound iPad plus my iPhone.

Bob Grove was one of the first publishers in the business of hobby radio to publish a magazine in electronic format and even today remains one of only a few to do so; most of the ham publications such as *QST* and *CQ* are still only available in printed editions. While I had been subscribing to *MTXpress* for several years, which I would read on my laptop computer, I now download it to my iPad and iPhone4 for convenient reading both at home and while burning up the skies traveling to such places as Mumbai, India, Tel Aviv, Israel, and Amsterdam, Netherlands.

The readability of *MTXpress* on the iPad is simply awesome with vivid colors and resolution that actually exceeds that of the print version. The downloaded Adobe™ Acrobat™



The July issue of MT on an iPad



Reading MT's SW Guide on the iPad

PDF file for each month's *MTXpress* edition can be saved in iBooks (an electronic bookshelf application for the iPad and iPhone) from which you can retrieve the magazine at any time.

If you find the print too small to read, no problem: You can easily magnify any page or part of a page on the iPad or iPhone with the commonly known two-finger "pinch." This works especially well on photos and graphics, something you couldn't even dream of doing with the print version.

While you can read *MTXpress* on the iPad or iPhone without being connected to the Internet, its real strength becomes apparent when you instantly link to the Internet from a reference link given in an article or the web address of an advertiser via the iPad web browser Safari. This is something that is much more laborious when using the print version, as you need to hand type the Internet URL into a computer or at the very least, cut and paste.

Not Just for Reading

I've been a ham since age 13 and, while I am active on the HF bands (mostly digital modes such as RTTY and PSK31), I also have a strong interest in utility monitoring (aviation and public safety). In my ham shack, I have two scanners which monitor local Seattle area aviation traffic – for which the enjoyment is enhanced by Boeing operating many newly built airliner test flights in the area. With the iPad, I can be anywhere in the world and still listen to Seattle area aviation traffic or any one of the 500+ global aviation monitor feeds using the LiveATC iPad and iPhone application (\$2.99 for the iPad & iPhone).

You can listen to thousands of global scanner feeds which include public safety, railroad, marine, and ham repeater scanner feeds on the iPad and iPhone using the 5-0 Radio Police Scanner application (lite version is free; \$5.99 for Pro version with over 33,000 additional feeds and recording capabilities).

Of course, you can also listen to over 40,000 AM and FM radio stations around the globe that stream programming via the Internet, using the TuneIn Radio Pro application which is available for both the iPad and iPhone with two versions: free and Pro (\$0.99). The Pro ver-

sion adds the capability of being able to record and archive what you hear. There are quite a number of other iPad & iPhone Internet radio applications available as well.

I wish that I could tell you that it was also possible to listen to remote amateur radio Software Defined Radio (SDR) stations, but these remote receiver sites use Java™ code in their web sites to display the receiver spectrum graphic and, unfortunately, Apple does not support Java at this time.

But wait, there's more!

Several other iPad and iPhone applications that might be of interest to readers (downloadable from the iPad and iPhone Apps Store) are:

Ship Finder HD – live tracking of ships (free version available; Pro version is \$7.99).

Plane Finder HD – similar to Ship Finder with live tracking of flights (free version with Pro version available for \$7.99).

Quakes – Earthquake notifications with maps (free for iPad and iPhone).

HamSat HD – graphic display of ham satellite tracks (\$4.99 for iPad & iPhone). A related but more enhanced application, ProSatHD, graphically depicts virtually all commercial, weather, **International Space Station** (ISS), ham, and other types of satellites (\$9.99 for iPad only).

Exam Prep – six different practice tests for various ham licenses (free for iPad & iPhone).

Ham Tool VX-3R – ITU region band plans, DXCC list, antenna calculator and some reference info for the Yaesu VX-3R (\$1.99 for iPad & iPhone).

Weather – a number of really excellent free weather applications exist for the iPad & iPhone including Intellicast.com, The Weather Channel, and AccuWeather all of which can display real-time weather radar.

73 HamLog – great for portable and mobile operators who want to keep a log, also features WWV and solar propagation reports, DX Cluster, call sign lookup (\$0.99 for the iPad).

I simply love my iPad and iPhone, and while I enjoy reading and storing *MTXpress* on my iPad, I can also enjoy some aspects of my radio hobby while I am traveling just about anywhere in the world. It's even possible to use most of the radio related applications featured above while flying on certain commercial flights that offer airborne Wi-Fi (such as Delta airlines). The iPad and iPhone are great tools for radio hobbyists, especially those who travel frequently.

The author may be reached via email at nw7d.ham@gmail.com

MT

MT Looks at e-Readers

By Bill Grove

With the swarm of digital devices constantly inundating the market, it can be a daunting task to decide which ones are just a fad or which ones hold merit. E-book readers are one of those devices that seem to be gathering quite a following. But are they just a fad or are they something that you should consider adding to your repertoire of gadgets and gizmos? Hopefully, with a little guidance, I can help you make the decision easier.

Kindling a Revolution

By far the most well-known “true” e-book reader is the Amazon Kindle™. Released by Amazon in November of 2007, the Kindle has become the go-to standard for e-book readers. With its book-like screen and incredible battery life it’s very easy to see why it has garnered such an auspicious reputation. What makes it so special? Let’s talk a bit about the technologies at work inside this portable library.

Varying screen sizes and communications options are a few of the common choices on today’s Amazon Kindle, but it’s the screen that really makes this little beauty shine. Using the latest e-ink technology, the Kindle can display words and photos on a page very similar to that seen in a printed book.

E-ink turns each pixel (one single dot in a huge matrix of dots that form the display) either black or clear, but unlike computer displays, the pixel stays in that state until power is applied to it once again telling it to turn either black or clear. This means that while a picture

is on the screen, if you remove the battery, the picture will remain! This allows unheard of battery life from these devices, often exceeding a month without the needing a charge.

Amazon has set up several deals with companies to add even more value to the Kindle. To start with, the Kindle store has a vast library of titles to choose from, many of which are free. You can store 3,500 books on all three current Kindle models, but your personal account on Amazon allows you to store an unlimited number of books, so you’re not limited to the memory of the device itself. And, Kindle software, available for your computer and other devices (such as the iPad, iPhone and Android OS), allows you to read the books that have been purchased through downloads on any of your devices, so you’re not limited to the Kindle e-reader alone.

Something else that makes the Kindle even more useful is the deal Amazon has struck with AT&T for the distribution of its books. If you purchase a Kindle with 3G connectivity (the device has a GSM -- Global System for Mobile Communications -- modem built-in), you can download your books from anywhere you can receive an AT&T signal and you can browse the Internet with the device. Cost of the monthly service? Free. Although the web browsing experience certainly isn’t optimal, the ability to quickly check your email or hit the web for some timely research makes the Kindle even more valuable. Everything is in black and white, but when all that matters is the information, the appeal of color is quickly dimmed by the knowledge that you have a device that is always there at the ready to look something up when you need it.

Barnes & Noble Nook

So, how could any other e-reader possibly compete with such an amazing device? With some interesting ideas of their own. Enter the Barnes & Noble Nook™. The Nook Color is the latest iteration of the Nook line and, as its name shows, is a full-color screen. Beyond

that, Barnes & Noble have integrated a touch screen into the device so that you have a more natural interaction with the screen. Although the Kindle’s built-in keypad (below the screen area) and side page-turn buttons which are functional, being able to flip pages as you would with a book by sliding your finger across the screen certainly gives the Nook a more natural feel.

But, all of this nifty technology comes at a cost, both figuratively and literally. The Nook Color costs a bit more than the Kindle (\$249 versus \$139 for the WiFi models), but worse is the battery life. The whole idea behind e-ink is the battery life and when you start throwing color and touch into the mix, the battery suffers. The Nook Color, with the WiFi turned off, only gets around 8 hours of battery life. When you’re an “always on-the-go” kind of person, this can certainly affect your purchasing decision.

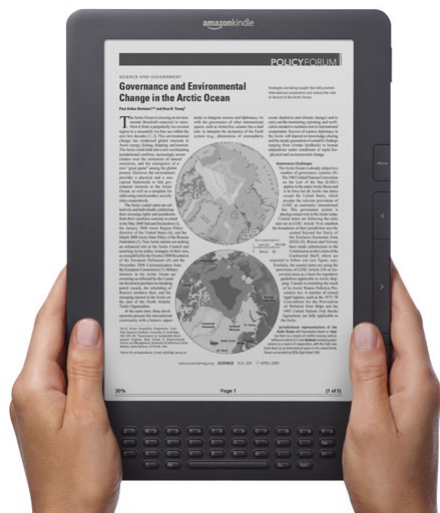
Sony Reader

OK, so you’re not convinced you need color, but that touch screen sure does sound nice. What’s a person to do? Well, our friends at Sony believe they have the perfect solution! Enter the Sony Reader™. There are many different models of the Sony Reader, but the primary differences are the screen size, memory and included accessories. With prices ranging from \$100-\$300, there are a lot of choices, but the technology is solid and tested. They have chosen to use the same type of e-ink technology as the Amazon Kindle, but have thrown in a natural touch screen, so you still have that book “feel,” but your battery life will allow you a good week or two between charges, far better than that of the Nook Color.



Apple iPad

Alright, so you have decided that color is great, touch screen is great but you still want more! Back in April of 2010, Apple introduced the iPad. Their latest entry into the “i” line of products features a 9.7” capacitive, color, multi-touch screen, WiFi, 3G (if you wanted to pay for it) and a very powerful CPU (com-





puter processor, or “brain”) as well as graphics processor. Not only did it have Apple’s smooth “feel” but it also brought with it a massive repository of software from the iTunes app store. The iPad is much more than just an e-reader, it’s a full-fledged computer with a versatile operating system and an absolute army of programmers and designers constantly working to add to it and improve on it.

So, what’s the iPad’s greatest shortcoming? Cost. The iPad starts at \$499 and goes up to a whopping \$829 and that’s for just the

unit. Start adding cases and gadgets and it can easily hop up over \$1000. The other downfall as an e-reader is battery life. With great power comes great drainage (not sure that’s how the original quote went, but I’m sticking with it). Expect to get about 8-10 hours of regular use out of your iPad’s battery. That makes it quite comparable to the B&N Nook Color, but at over twice the price.

Is there something else?

On the horizon are a plethora of choices. On the cheap side are the Android-based tablets from a dozen or more makers that are flooding the market. Android tablets are direct competitors to the Apple iPad but are far cheaper. They don’t have Apple’s massive programming team, but are quickly gaining a foothold due to their low prices (as low as \$100 for a color, multi-touch device).

Another option will be the Microsoft Windows™-based tablets that will be quickly rolling off the manufacturing floors throughout this year and next. They will offer a “real” operating system (Microsoft Windows 7) as well as USB and Ethernet ports. The downfall



will be with cost as well as battery life. Since it will be a full-blown operating system, you can expect to only get between 2-4 hours of active battery life from the Windows systems. But, most likely, the systems will have replaceable batteries, so you can swap them on-the-go to give your device new life, something the iPads and Androids don’t offer.

There you have it! That’s where we are today. Still confused? Don’t worry, I can help. Need a good e-reader only and you’re happy with black and white? Get the Kindle. Although the Sony is a great option, the Kindle is only going to grow in its support base and its quality is outstanding. With the best battery life on the market you can just throw it in a bag and tote it knowing it’s always ready when you are.

If you really want the color and the touch, go for the iPad. These things are incredible. Yes, they are expensive, but you get what you pay for. Want to listen to your scanner but you don’t have it with you? There’s an app for that. Want to check what movies are playing? There’s an app for that. Want to go on a diet and need some tracking and help? There’s an app for that.

The “there’s-an-app-for-that” commercials aren’t kidding. If you can think of it, there’s probably already an app for it. This market is always changing and expanding, so before you buy, research. Hit the Internet and start seeing what’s out there and what deals you can find. I would like to be the first to welcome you to the world of digital print. It only gets bigger from here.

MT

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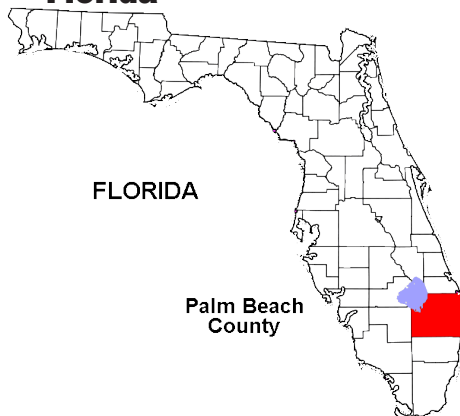
The Open Sky Misnomer

In previous columns we've covered the difficulties public safety organizations have experienced attempting to install and operate a particular type of radio system called Open Sky. This fully digital, Internet Protocol-based radio network uses the same 800 MHz frequencies as the far more common Motorola analog and Project 25 digital public safety radio systems, but the specific technical details of how it works have been kept a secret by the manufacturer.

Such a closed, proprietary product has made Open Sky a particular sore spot for scanner listeners, because without those details it is very difficult to produce a device that can monitor the system. Although the design of Open Sky dates back more than 15 years, no scanner manufacturer has done the significant legal and technical work to incorporate an Open Sky capability into an affordable mass-market product, leaving listeners locked out.

In the meantime, Open Sky customers are finding it nearly as difficult to get a system up and running that meets their requirements.

❖ Palm Beach County, Florida



Palm Beach County is located in southeastern Florida between Lake Okeechobee and the Atlantic Ocean and is home to more than 1.3 million residents. It is the largest county by land area in the state, covering more than 2,000 square miles.

In 1993, 33 municipalities formed the Municipal Public Safety Communications Consortium (MPSCC) of Palm Beach County to investigate the possibility of purchasing and operating a shared public safety radio system that would improve interoperability between local agencies. After years of review, the Consortium selected an Open Sky radio system in 2003 and signed a contract with manufacturer M/A-COM in 2006.

During this time, Palm Beach County installed and began operating a Motorola trunked radio system in August 2000. Three large cities, Boca Raton, Boynton Beach and Delray Beach, left the MPSCC to join the county system. Today there are six municipalities that remain in the Consortium: Atlantis, Juno Beach, Jupiter, Palm Beach, Palm Beach Gardens and West Palm Beach.

Palm Beach Gardens has been using the Open Sky system since 2009 and Palm Beach since last year. Jupiter went live this year on May 5. Juno Beach and West Palm Beach continue to use older radio equipment while they prepare for transition to Open Sky. West Palm Beach Fire-Rescue is served by the Palm Beach County system, which is scheduled for upgrading to Project 25 over the next couple of years.

❖ West Palm Beach, Florida

The City of West Palm Beach had been planning to join the Open Sky system since 1999 and is tentatively set to finally join this September. They have spent \$3.6 million for equipment and another \$465,000 in maintenance and have yet to authorize the purchase of 400 Open Sky radios at a cost of \$1.6 million. In addition, the City pays the MPSCC about \$170,000 a year in fees.

Earlier this year a commissioner for the City of West Palm Beach, Florida claimed the City administration withheld a report critical of the Open Sky system. The 44-page report was written by the City's technical team in response to an April 2010 request, but was never provided to commissioners. It provides a detailed list of reported problems and objections to the MPSCC Open Sky system and recommends a number of alternatives that they claim will better serve the City and its taxpayers.

The report identifies a number of technical failings of the Open Sky system, including dead

spots and poor coverage, poor building penetration, calls that don't go through, jury-rigged connections to provide connectivity and limited interoperability with nearby systems. Poor audio quality is also detailed, including garbled speech, excessive background noise and "computer generated" voices that make it impossible for dispatchers to identify officers by the sound of their voice.

According to this report and local news, the system failed in May 2011 during a chase when a Palm Beach Gardens officer was unable to communicate with a county helicopter while pursuing a stabbing suspect.

❖ Testing Open Sky

West Palm Beach conducted a full-scale test of Open Sky in September 2009 and found numerous, severe problems. The Open Sky vendor at the time, M/A-COM, at their own cost replaced 130 radios valued at \$450,000 and erected an \$85,000 repeater site to provide greater coverage in the western communities.

Interestingly, during these tests the existing Motorola system operated from a single location at the city water treatment plant using 13-foot antennas. The Open Sky system operated from three sites within the city, including the water treatment plant, and used 20-foot antennas. Despite these advantages, the Open Sky system performed substantially worse than the Motorola system, including poor coverage. The City expects to add additional repeater sites to provide adequate coverage.

The MPSCC plans on using 16 towers to cover their six towns, while the county system uses 10 sites to serve the entire county. The City report estimates another \$8 million in infrastructure costs and a doubling of operating expense would be necessary to bring Open Sky up to the level of performance and reliability currently provided by their Motorola system.

A February test in West Palm Beach identified 13 buildings into which radio signals did not penetrate with sufficient strength to communicate effectively. According to the MPSCC, building owners will be required to purchase amplifiers, which may end up costing as much as \$50,000 per facility to install. The city already spent \$50,000 to equip the police station and city hall with amplifiers, which previously suffered from poor in-building radio coverage.

Palm Beach fire trucks have been equipped with \$8,000 repeaters in order to provide on-scene coverage and improve signal penetration into buildings during firefighting operations.

The report identifies differences in testing



methodologies that unfairly favor Open Sky. For example, to test coverage, the geographic service area of the radio system is divided into grid squares that are 1/2 mile by 1/2 mile. The City's current Motorola system was required to successfully communicate at 100 different locations within each grid square before being accepted. The Open Sky system was only required to communicate at one location in each square in order to be declared successful.

The report also identifies a curious problem known as "dynamic dead spots." In any radio system there will be a handful of locations where communication is not possible, due to interference, blockage, or other causes. System designers work to minimize such locations and public safety personnel learn not to use radios in those spots. As reported by West Palm Beach and other Open Sky users across the country, dead spots in an Open Sky system appear to move around. A user may be able to communicate effectively one minute, but the same user with the same radio at the same spot may not be able to communicate a few minutes later.

Perhaps the most telling admission made by the MPSCC, the proponent for Open Sky, appeared in a letter to the Federal Communications Commission (FCC) requesting an extension to a build-out requirement. The MPSCC letter provides the excuse that "system and subscriber software problems [that] prevent the system from being utilized for mission critical operations." As of June 2011, the MPSCC call sign, WQKC299, has a note indicating that "This call sign or a component(s) of this call sign is in termination pending status for failure to meet the buildout requirement."

The FCC Notice of Termination Letter lists 854.0375, 854.0625 and 854.4875 MHz as frequencies the MPSCC may lose due to their buildout delay. These frequencies were licensed to transmit from repeater sites in Atlantis, Lake Park, Palm Beach Gardens and West Palm Beach. The construction deadline was March 25, 2011.

❖ West Palm Beach Motorola System

The City of West Palm Beach currently operates a Motorola Type II SmartNet on the following licensed frequencies: 854.9625, 855.1375, 856.4375, 856.7125, 856.9625, 857.4375, 857.7125, 857.7875, 857.9625, 858.4375, 858.7125, 858.9625, 859.2125, 859.9625 and 860.7125 MHz. These frequencies are transmitted from two primary sites in West Palm Beach, one on the north edge of Clear Lake near the intersection of North Australian Avenue and 7th Street and the other at the East Central Regional Water Reclamation Facility adjacent to the turnpike.

Decimal	Hex	Description
16	001	Police and Fire (Common)
48	003	School Burglary Alarms
80	005	Interagency
112	007	Police, Fire and Public Works (Common)
1584	063	Police Vehicle Maintenance
1616	065	Police (North Dispatch)
1648	067	Police (South Dispatch)
1680	069	Police (Information)
1712	06B	Police Tactical 4 (North District)
1744	06D	Police Tactical 5 (South District)
1776	06F	Police Tactical 6 (Non-Patrol)

1808	071	Police
1840	073	Police Eyewatch (Citizens On Patrol)
1904	077	Police Supervisors
1936	079	Police Staff Services
1968	07B	Police Special Events
2000	07D	Police Dynamic Regroup 1
2032	07F	Police Dynamic Regroup 2
2064	081	Police Citizen Observer Patrol (COP) 1
2096	083	Police Citizen Observer Patrol (COP) 2
2128	085	Police
2160	087	Police Tactical 4C (North District)
2192	089	Police Tactical 5C (South District)
2224	08B	Police Tactical 6C (Special Operations)
2256	08D	Police Training 1
2288	08F	Police Training 2
2320	091	Police Training 3
2352	093	Police Special Weapons and Tactics (SWAT)
3120	0C3	Police Criminal Investigative Division (CID)
3216	0C9	Fire (Dispatch)
3248	0CB	Fire and Emergency Medical Services
3280	0CD	Fireground 1
3312	0CF	Fireground 2
3344	0D1	Fireground 3
3376	0D3	Fire Prevention
3408	0D5	Fire Administration
4816	12D	City Services
4848	12F	Garbage Collection 1
4880	131	Garbage Collection 2
4944	135	Finance Department
4976	137	Building Department
4992	138	Traffic Engineering
5008	139	Traffic Operations
5072	13D	Street and Traffic Maintenance
5136	141	Electrical Maintenance
5168	143	Emergency Operations Center (EOC)
6416	191	Water Department
6448	193	Public Works
6480	195	Public Works

❖ Kanawha County, West Virginia



In many areas of the country, public safety agencies continue their migration to digital systems. Over the next year agencies in the capitol area of West Virginia will shift away from their old analog radios and join a statewide digital network. The State operates the West Virginia Interoperability Radio Project (WVIRP), a statewide Project 25 digital radio network.

Charleston is the capitol of West Virginia, located in Kanawha County. While the City has a population of just over 51,000, the larger metropolitan area is home to more than 300,000 people.

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Several agencies in Charleston, including the Fire Department, have been using digital radios for more than a year.

Nitro is a town of about 7,000 people, located along the Kanawha River about 12 miles west of Charleston. St. Albans is an adjacent river town and home to nearly 11,000 people. These two towns are the first Kanawha County municipalities outside of Charleston to switch to digital operation on WVIRP, motivated by gaps in coverage and a lack of additional analog frequencies.

During the transition period and for some time to come, there will be many active VHF (Very High Frequency) radios in operation that can be monitored with nearly any scanner, since the transmissions are simple analog voice.

Frequency	Description
151.0250	Nitro Fire (Dispatch)
151.1000	County Emergency Medical Services (Dispatch)
151.1450	County Schools
151.2725	County Schools
151.3025	County Fire (Operations)
151.6850	County Schools (Buses)
153.8300	County Fire (F4)
153.9050	West Virginia University
154.0400	Charleston Emergency Medical Services (Dispatch)
154.0550	Dunbar Police (Dispatch)
154.1000	Charleston Sanitation and Traffic Engineering
154.1150	South Charleston Maintenance
154.1600	Belle Fire
154.2800	County Fire (F3)
154.2950	County Emergency Medical Services
154.3700	South Charleston Fire (Dispatch)
154.3850	Charleston Fire (Dispatch)
154.7325	County Sheriff
154.7550	Charleston Police
154.8900	Charleston Drug Unit
154.9650	Dunbar Fire (Dispatch)
154.9950	Charleston Street Department
155.0100	St. Albans Police (Dispatch)
155.0250	St. Albans Fire (Dispatch)
155.0400	West Virginia Archives
155.0550	Town of Nitro
155.1000	Charleston Police
155.1450	County Fire (Dispatch)
155.1600	HealthNet (Dispatch)
155.1900	Charleston Police
155.2650	County Emergency Medical Services (Tactical)
155.4750	Police Interdepartmental
155.5350	Charleston Criminal Investigation Detectives
155.6250	County Sheriff (Dispatch)
155.7450	County Fire (F2)
155.7750	South Charleston Street Department
155.8200	County Schools (Buses)
155.8650	Nitro Police (Dispatch)
156.1950	County Municipal Police (Dispatch)
156.2250	County Office of Emergency Services (Bee Mountain)
158.7300	South Charleston Police
158.7450	West Virginia Archives
158.7750	County Regional Transport
158.7900	South Charleston Police (Dispatch)
158.8350	County Regional Transport
159.1500	Charleston Police (Dispatch)
159.2100	Charleston Police

Frequencies in the UHF (Ultra High Frequency) band carry mostly fire and medical traffic, also in analog format.

Frequency	Description
453.1000	County Fire (Bee Mountain patch to 155.145)

453.1500	County Fire (Cross Lanes patch to 155.145)
453.4000	County Fire (Clendenin patch to 155.145)
453.5250	State Capitol (Maintenance)
453.7875	County Fire (Glasgow patch to 155.145)
453.9875	County Fire (Edens Fork patch to 155.145)
458.2875	County Fire (Sumerco patch to 155.145)
460.9000	County Fire (Edens Fork Repeater)
461.8500	Life Ambulance Service (Dispatch)
464.2500	County Fire (Malden Mountain Repeater)

In addition, some frequencies carry digital traffic. Radios on these frequencies use the Common Air Interface (CAI) defined by the APCO Project 25 standards. These frequencies are used conventionally, meaning they are not trunked, so any digital-capable scanner, including first generation models like the Bearcat BC250D and BC785D, can monitor them.

Frequency	Description
158.8950	Charleston Drug Unit
453.3625	County Office of Emergency Services
854.9625	State Capitol (Security)
855.2125	State Capitol (Security)
855.4625	State Capitol (Security)

❖ West Virginia Interoperability Radio Project (WVIRP)

Like some of the conventional frequencies in Kanawha County, the West Virginia Interoperability Radio Project uses Project 25 (P25) standards to carry voice traffic in digital format. However, WVIRP is also a P25 trunked system, meaning the voice channels are shared among a disparate set of users according to Project 25 trunking standards. What this means for scanner listeners is that not only is a digital-capable scanner necessary to hear activity on the system, but the scanner must also be capable of tracking a P25 control channel. Fortunately, there are a number of scanners on the market that are capable of doing so:



Manufacturer	Model
GRE	PSR-500, PSR-600, PSR-800
Radio Shack	Pro-18, Pro-106, Pro-197
Uniden	BCD396T, BCD396XT, BCD996T, BCD996XT, HomePatrol

There are five WVIRP sites within Kanawha County, transmitting on the following frequencies:

Site	Frequencies
Malden	453.1625, 453.6125, 453.8125, 460.0375, 460.2375, 460.4625
Charleston	453.3875, 453.6625, 453.6875, 460.0625, 460.1375, 460.2875, 460.3375
State Capitol	453.6500, 453.7375, 460.0875, 460.4125, 460.6375, 461.5375
Clendenin	453.1875, 453.4125, 453.5875, 453.8000, 460.0500, 460.3125
St. Albans	453.4375, 460.1500, 460.6125, 460.6750, 463.3750, 464.2750

The talkgroups listed below are monitored activity in Kanawha County. Nitro and St. Albans activity, along with other county municipalities as they transition, should also appear close to this range of talkgroup numbers.

Decimal	Hex	Description
6100	17D4	Emergency Operations (Tactical 1)
6104	17D8	Carper Justice and Public Safety Complex (Maintenance)
6105	17D9	Yeager Airport (Operations)
6110	17DE	Emergency Operations (Administration 1)
6111	17DF	Emergency Operations (Administration 2)
6120	17E8	Sheriff (Dispatch)
6121	17E9	County Law Enforcement (East)
6122	17EA	County Law Enforcement (West)
6123	17EB	Judicial Annex
6124	17EC	Special Operations 1
6125	17ED	Special Operations 2
6126	17EE	Special Operations 3
6130	17F2	Municipal Fire (Dispatch)
6131	17F3	Municipal Fire (Operations)
6132	17F4	Municipal Fire (Operations)
6133	17F5	Municipal Fire (Operations)
6134	17F6	Municipal Fire Operations
6135	17F7	Municipal Fire (Operations)
6140	17FC	Fire (Dispatch)
6141	17FD	Volunteer Fire (Operations)
6142	17FE	Volunteer Fire (Operations)
6143	17FF	Volunteer Fire (Operations)
6150	1806	Emergency Medical Services Advanced Life Support (Dispatch)
6151	1807	Emergency Medical Services (Operations)
6152	1808	Emergency Medical Services Basic Life Support (Dispatch)
6153	1809	Emergency Medical Services (Operations)
6154	180A	Emergency Medical Services (Operations)
6155	180B	Emergency Medical Services (Operations)
6170	181A	Mutual Aid 1
6171	181B	Mutual Aid 2
6172	181C	Mutual Aid 3
6173	181D	Charleston Police (Traffic Units)
6181	1825	Health Department Operations 1
6182	1826	Health Department Operations 2
6183	1827	Health Department Operations 3
6184	1828	Health Department Operations 4
6210	1842	Charleston Fire (Dispatch) (Simulcast on 154.385 MHz)
6211	1843	Charleston Fire 2
6212	1844	Charleston Fire 3
6213	1845	Charleston Fire 4
6214	1846	Charleston Emergency Medical Services (Dispatch)
6215	1847	Charleston Emergency Medical Services 2
6220	184C	Charleston Police (Dispatch)
6221	184D	Charleston Police (Operations)
6222	184E	Charleston Police (Tactical)
6223	184F	Charleston Police (Operations)
6224	1850	Charleston Police (Operations)
6225	1851	Charleston Police (Special Events)
6226	1852	Charleston Police (Operations)
6227	1853	Charleston Police (Operations)
6228	1854	Charleston Police (Operations)
6277	1885	County Humane Department

That's all for this month. I welcome your comments and questions via electronic mail to danveeneman@monitoringtimes.com, and as always you can check my website at www.signalharbor.com for more frequencies and other radio-related information, including details on various Open Sky systems across the country. Until next month, happy scanning!



Q. On a recent History Channel show it was stated that the penalty for Germans listening to BBC broadcasts was death, which appeared to be of little deterrent. Wasn't jamming practiced then? (Mark Burns, Terre Haute, IN)

A. Yes, it was. The Nazis attempted to jam BBC and other Allied stations, but more transmitters and more frequencies kept being added to overcome the jamming. In addition, Allied aircraft dropped leaflets into Nazi Germany with instruction on how to build a simple, directional, loop antenna to add to German radios to null out the jamming stations.

Q. With the virtual elimination of analog voice above 470 MHz, why are these upper frequency ranges still included in analog scanners? (J.J. Owens, NC)

A. There's really no reason not to include them; if there's nothing of interest to be heard in your area, don't listen to those ranges. The technology for total frequency coverage is well established and cheap to implement, and hobbyists don't want to be deprived of any listening possibilities. Some scanners are used as test-bench instruments. Manufacturers compete by producing wider and wider frequency ranges. Such receivers can be used to detect band occupancy, interference location, and other non-voice applications.

Q. While doing a little DXing on the normal AM band, I ran across a very weak signal on 950 kHz. It appears to be a time signal with just a tick every second and a quick Morse code ID. I only receive it at night. Any idea what it is? (Michael Brock, email)

A. These are time ticks from Cuba's Radio Reloj (Spanish for "clock"). They are heard on 570, 820, 860, 870, 930, 950, 960, and 1020 kHz.

Q. I am having trouble accessing a local two-meter repeater with my hand-held transceiver. I read a comparison of whip antennas

that showed the Grove ANT-08 as being the best because of its adjustable length. I see that it has been discontinued. Will your current ANT-06 perform as well? (Dennis Hyde, KJ6MIW)

A. That review virtually paralleled one that I did a year or so ago in *MT*. A quarter-wave resonant antenna at 18"-19" in the 144-174 MHz range works better than the typically-shorter rubber duckies that don't have the capture area or impedance match at the proper frequencies. You will be pleased to learn that the replacement for the old ANT-08 is our ANT-06 shown at www.grove-ent.com/ANT6.html. Simply adjust it to 19" length and you will have the same superior results.

Q. I want a simple, hand-held scanner without all the bells and whistles. I simply want to turn it on, punch in frequencies between 28 and 1300 MHz, hit SCAN, and listen. Are these still made? (Eric Croft, Ceipachet, RI)

A. With the tremendous increase in sophisticated VHF/UHF communications, it's hard to find a basic scanner anymore. However, for the limited set of requirements you have requested, I would strongly recommend you consider the Uniden BC-95XLT.

Even though it does not include the 1300 MHz requirement, there's virtually nothing you would hear above 960 MHz except occasional point-to-point hams. It does cover up to 960 MHz, the upper limit of major UHF communications. None of these low-end, non-trunking, non-shortwave scanners, however, covers the 225-400 MHz military aircraft band.

If you must have that higher range, then you will have to pay considerably more and have a wide variety of other features as well like trunk-tracking. Or, you can select from a number of hand-held scanning receivers that includes shortwave. The bottom end of that category would be the BC346T (approximately \$250).

Neither of these scanners covers the military aircraft band (225-400 MHz).

Q. I purchased the Austin Condor antenna and found no noticeable improvement over the factory supplied antenna. (John Fawcetti, Bartonville, IL)

A. Multiple tests have been made by independent technicians on comparative antennas over a wide range of frequencies. All tests that I have seen as well as those that I have personally made, place the Condor right up on top. That is why Grove carries them and why they are widely sold. Even so, there are many variables that can affect comparisons.

On any antenna, performance will be better on some frequencies than on others. Assuming resonance, a long antenna will always pick up stronger signals than a short antenna. To compare antennas, conditions must be precisely duplicated (location, position, elevation, received signal level, surrounding obstacles, feed-line if used, etc.). Tests must be made at the same time to avoid propagation changes. A signal-strength meter must be used to avoid intuition influencing actual measured performance.

Q. I understand the MFJ-1020C can be used to tune a longwire. Are we talking significant improvement on my Realistic DX320 and Hallicrafters 118 with a Heathkit 125 Q multiplier? (Bill Krupiczewicz)

A. When we speak of a "tuner" for short-wave reception, we generally mean a tunable preselector rather than an impedance-matching transmatch as used with transmitting antennas.

A preselector's tuning knob is adjusted to pass a specific, narrow swath of spectrum and present it to the receiver while also suppressing strong, out-of-band signals which can cause images (phantom signals produced by overloading the receiver's amplification stages), and general desensitization (reducing the receiver's weak-signal reception).

The MFJ-1020C also contains an optional preamplifier to boost incoming weak signals when using the short whip. Such amplification is unnecessary when using a large antenna because it increases the signal and the noise together, resulting in no signal improvement above the noise, only a higher reading of both on an S-meter.

If your receiver experiences overload symptoms as discussed above, then a preselector like the MFJ-1020C would be recommended.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)



More Changes at CFH

CFH, the Canadian Forces communication station in Halifax, Nova Scotia, continues to change things. One might remember earlier in 2011, when the weather broadcasts in radiofacsimile (fax) and radio teletype (RTTY) simply vanished without notice. Well, on June first, the other CFH RTTY transmission also went away.

In the second case, though, the only change is in the transmission mode used. Like most members of the North Atlantic Treaty Organization (NATO), Canada has switched its RTTY traffic to a newer mode called STANAG 4285. Message content remains the same.

This content is usually a channel availability marker fairly similar to those sent by other NATO members. A lucky few have heard the station actually work someone. It has always had a huge signal in the eastern US and Europe, though here in California it depends on band conditions.

While the mode has changed, the frequencies have not. They are still 5097, 10945, and 15920 kilohertz (kHz). However, listeners will probably notice "new" frequencies for the STANAG 4285, since its 1.8 kHz channel center and general signal parameters are different from RTTY. Radios tuned in USB will usually be centered correctly when the dial/window reads 1.8 kHz lower than the listed frequencies.

All this might seem like a lot of fuss over an arcane military transmission that few people would actually listen to for any length of time after adding it to the log. Mostly, the issue concerns the continuing disappearance of RTTY. Most of what's left outside the amateur bands in North America has strong signals, but it is heavily encrypted and uncopiable. Unencrypted Baudot RTTY is something of a vanishing species.

❖ Arcane Military Transmission?

Yes, unless the listener has had training in this area, or has knocked around this hobby long enough to understand some really old-school procedures. Let's look at what comes out of CFH.

Most of the time, what's heard is long periods of a STANAG 4285 idler padded to all one states. This is punctuated at a regular interval by a marker reading something like: NAWS DE CFH ZKR F1 2822 3394 4158 6242 8324 12371 AR.

Military procedures tend to get a lot of information into a few characters.

"NAWS" is a really old military collective call sign which at least used to stand for, "Notice to Allied War Ships." It's basically a hello-all-friendly-vessels callup. "DE" is the traditional procedural signal for "from." It means the next characters copied will be a station identifier. CFH, of course, is the station's call.

ZKR is a military Z-signal meaning, "I am maintaining watch on [frequency list in kHz]." A lot of military stations use Z-signals, and it's worth having a list of them at hand. Finally, AR is the procedural signal for "end of message."

❖ Finding STANAG 4285

As noted, most of the old RTTY (aka RATT) communication by militaries has gone to STANAG 4285. It's a newer mode, though it's old by digital standards. The name refers to NATO's practice of agreeing on Standardization Agreements (STANAGs) for everything from ammo sizes to the color of vessels.

There are over a thousand of these. Number 4285 provides for a standard radio modem using single-tone modulation and user-selectable bit rates. The waveform is optimized for long-distance data broadcasting or point-to-point communication, mostly by navies, using the high frequency (HF) band.

STANAG 4285 is all over the bands. Everyone's heard it. It's that jet plane noise. Especially at night, frequencies around 8 megahertz (MHz) can really light up with the stuff. It's a steady, very purposeful sounding *whoosh*. Sometimes it starts and stops, but usually it runs continuously, even if idling.

The jet noise is a slow phase cancellation caused by cyclic selective fading in the

ionosphere. Think of it as nature's version of the phase shifters used by musicians. The effect is strikingly visual on waterfall or spectrogram displays, where dark lines sweep across the fuzzy bandwidth of the signal.

Since STANAG 4285 comes from militaries, finding unencrypted signals has always been something of a challenge, especially away from Europe. The French Navy has been the best bet for the Pacific coast.

Lately, FUM in Tahiti has been extremely strong into California at night. It's on 8625.0 kHz, channel center of 8626.8, with hours of clean decodes. It, too, runs markers, but these are identical in content to older RTTY test loops, right down to the "RYRY..." strings and "VOYEZ VOUS LE BRICK..." test phrases. The steady signal and unvarying content has allowed testing here of various sound card decoders available to hobbyists for less than several thousand dollars. The well regarded Sigmira (freeware) has provided the most consistent copy.

Now, though, we also have CFH to try our hand at attacking STANAG 4285. And attacking is just what one must do. It feels sometimes as if one is back in World War II Bletchley Park, trying to puzzle out something important with a few pieces missing.

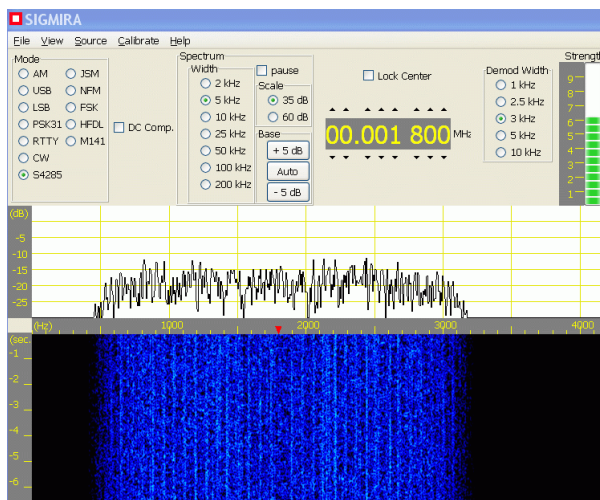
❖ Decoding STANAG 4285

This mode has a well-deserved reputation for being maddeningly difficult to copy. It hides its signal parameters and makes high demands on hardware and software alike. There's no way to tell encrypted signals by ear. Weak signals are hard to distinguish from noise, even on waterfall displays. Tuning can be quite a challenge.

As always, the best way to catch something is to understand it first. STANAG 4285 is 8PSK, or phase-shift keying with eight states. It gives a distinctive 8-pointed star on phase constellation displays, or at least it should in the absence of noise and fading.

As noted, the center of information is at 1.8 kHz. The bandwidth is around 2.4 kHz, neatly fitting into a single-sideband voice channel. When properly tuned, a waterfall will show a fuzzy mass between approximately 600 and 3000 hertz.

The mode has a constant symbol speed of 2400 per second, but differences in modulation allow the user to select apparent data rates from 75 to 3600. This means that the decoder will sync when it's tuned right, but it's up to the



listener to pick the proper speed. The only way of knowing everything's correct comes when and if the copy changes from gibberish to something resembling military communication. CFH uses a 75 speed, same as their old RTTY, while the French prefer 300 or 600.

Like many digital modes, STANAG 4285 attempts to cope with channel noise and fading by interleaving the data stream. It's up to the user to select short or long interleave. Fortunately, every signal so far encountered uses long, so it's fine to just keep it there.

If everything's right, the sync light will come on, the confidence bar will go to a nice high reading, and when the interleaver/deinterleaver does its work, out will come the data. Of course, now one needs to configure for the right kind of data. For plain text teleprinting, the choices are ASCII (American Standard Code for Information Interchange) or ITA2

(International Telegraph Alphabet number 2).

ITA2 is a 5-bit character set used by the older RTTY. It's been around a very long time. Fortunately for listeners, just about every copyable station has continued RTTY conventions. Not only is ITA2 used, but the bit framing is set to mimic the old RTTY frame of one start bit, 5 data bits, and one or two stop bits. This means that the only decision here is between "5N1" and "5N2" framing. The latter roughly imitates the old RTTY standard, with its long stop bit.

All of this sounds more formidable than it is. Mostly, experience allows one to evolve a systematic attack for the ominous whoosh. Even better, use the parameters shown in other people's loggings before tweaking things. Yes, it's challenging, but that's the attraction.

Until next month, happy *whooshing*.

ABBREVIATIONS USED IN THIS COLUMN

AFB.....	Air Force Base
ALE.....	Automatic Link Establishment
AM.....	Amplitude Modulation
ARQ.....	Automatic Repeat reQuest
CAMSLANT.....	USCG Communications Area Master Station, Atlantic
CAP.....	US Civil Air Patrol
CDC.....	US Centers for Disease Control
COTHEN.....	US Customs Over-The-Horizon Enforcement Network
CW.....	On-off keyed "Continuous Wave" Morse telegraphy
DHFCs.....	UK Defence High-Frequency Communications Service
DSC.....	Digital Selective Calling
FAX.....	Radiofacsimile
FEMA.....	US Federal Emergency Management Agency
FM.....	Frequency Modulation
HFDL.....	High-Frequency Data Link
LDOC.....	Long-Distance Operational Control
LSB.....	Lower Sideband
M08a.....	Cuban CW/MCW, 1-0 substitutes ANDUWRIGHT
MFA.....	Ministry of Foreign Affairs
MX.....	Generic for Russian single-letter beacons/markers
MARS.....	US Military Auxiliary Radio System
MCW.....	Modulated CW, direct or in AM
NASA.....	US National Aeronautics and Space Administration
NAT.....	North Atlantic oceanic air control, families A-F
NATO.....	North Atlantic Treaty Organization
NCS.....	US National Communications System
NTCN.....	US National Telecommunications Coordinating Network
PACTOR.....	Packet Teleprinting Over Radio, modes I-III
PSK.....	Phase-Shift Keying
RTTY.....	Radio Teletype
Selcal.....	Selective Calling
SESEF.....	Shipboard Electronics Systems Evaluation Facility
SHARES.....	SHARED RESOURCES (US federal frequency pool).
SITOR.....	Simplex Telex Over Radio, modes A & B
STANAG 4285.....	NATO 8-ary PSK teleprinting
UK.....	United Kingdom
Unid.....	Unidentified
US.....	United States
USAF.....	US Air Force
USCG.....	US Coast Guard
VC01.....	Chinese language voice chip robotic "female"
V13.....	Taiwan "New Star," music and numbers
Volmet.....	Formatted aviation weather broadcasts
X06.....	Russian Intelligence "Mazielka" selcal

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

277.0	CHT-Non-Directional Beacon (NDB), Chiltern, England, MCW identifier at 1741 (Mike-West Sussex, UK).
293.0	OB-NDB, Brussels National Airport, Belgium, MCW at 1801 (Mike-UK).
326.0	LM-NDB, Le Mans, France, MCW at 1835 (Mike-UK).
351.5	PLA-NDB, Pula, Croatia, MCW at 2027 (Mike-UK).
354.0	FE-NDB, Fiumicino, Italy, MCW at 2052 (Mike-UK).
360.0	OS-NDB, Goteborg, Sweden, MCW at 2106 (Mike-UK).
4150.0	"V"-Russian solitary beacon (MX), Khiva, CW at 1835 (Ary Boender-Netherlands).
4325.9	"R"-Russian solitary beacon (MX), Izhevsk, CW at 1835 (Boender-Netherlands).
4530.0	Unid-Chinese Robot (VC01), parallel 7684, LSB rapid-fire machine numbers at 1423 and 1829 (Boender-Hong Kong). [GlobalTuner Remote. -Hugh]
4742.0	Unid-UK Royal Air Force, working Tascomm at 1140 (Michel Lacroix-France).

4757.0	USDAHQ1-US Department of Agriculture, calling 010CDCNHQ and 011CDCNHQ, CDC, big FEMA exercise on National Public Health Radio Network (NPHRN); also on 5820, 8023. 9414.5, 10202, 11485, 12164, 13488, and 15658; all ALE, at 1642 (Jack Metcalfe-KY).
5153.7	"D"-MX cluster, Odessa, CW at 1939 (Lacroix-France).
5154.0	"C"-MX cluster, Moscow, CW at 1940 (Lacroix-France).
5206.0	Control-Possible UK cadet training, at 0652 (Lacroix-France).
5616.0	Gander-NAT-C, Newfoundland, position from American 152, at 0442 (Allan Stern-FL).
5723.0	Charlie Foxtrot-US military, calling Charlie in possible tracking net, also possibly 7591.6, at 0343 (PPA-Netherlands).
5745.0	Unid-US Navy Norfolk SESEF, VA, going to 10711 kHz with Mayport SESEF, FL, at 1427 (Metcalfe-KY).
5898.0	Unid-Cuban "cut number" station (M08a), MCW callup and numbers in substituted 5-letter groups, at 0505 (PPA-Netherlands).
6340.5	NMF-USCG, Boston, FAX satellite image and surface analysis, at 0402 (PPA-Netherlands).
6532.0	VP-BPY-Orenburg Airlines B737, flight R29945, HFDL position for Shannon at 2345 (MPJ-UK).
6550.0	Coast Guard 041-Netherlands Coast Guard mobile, coded position for Coast Guard Centre, at 1852 (PPA-Netherlands).
6586.0	New York-Caribbean air control, position and weather with FedEx 9302 (Federal Express freighter), at 0358 (Stern-FL).
6640.0	American 5FR-American Airlines B757 identifying with company fleet number, sent to 5547 by New York LDOC, at 0550 (Stern-FL).
6700.0	Unknown-Possibly French Air Force "Veilleur," at 1135 (Lacroix-France).
6806.0	AVS-CAP, calling 0011ARCAP in ALE, then voice as Avenging Spirit calling AR11, no joy on either, at 1919 (Metcalfe-KY).
6836.5	ONTVA-Possible Netherlands military, ALE sounding, followed immediately by 1000A, in ALE link checks with 308A and 302A, at 2058 (ALF-Germany).
6854.0	Unid-Probably M08a, Cuba, CW 5-letter groups at 2218 (Metcalfe-KY).
6876.5	"T-1-R"-TN-National Guard, discussing disaster medical evacuation with "T-3-R," at 2151 (Metcalfe-KY).
6902.6	WNG740-US Department of State, ALE sounding at 0247 (PPA-Netherlands).
6991.5	EA2SW-Spanish Civil Protection REMER (Red Radio de Emergencia), San Sebastian, calling large net with "Tango" callsigns, at 2135 (ALF-Germany).
7314.0	AAN4EKY-US Army MARS, net with AAN4TN, possible TN State Emergency Operations Center, at 1822 (Metcalfe-KY).
7348.0	FR5FEM006-FEMA Region 5, exchanging ALE text messages with FR-5FEM005, also FEMA, at 1958 (Metcalfe-KY).
7391.5	NNN0AHH-US Navy/ Marine Corps MARS training net, gave other frequencies as 4042.5, 7382.5, and 14385; at 1729 (Metcalfe-KY).
7527.0	TWVA2-Spanish Guardia Civil, Leon, calling TXX2, Madrid, ALE at 0423. OMNI-COTHEN remote transmitter, possibly Omaha, NE, ALE sounding at 0422. PCR-USCG Cutter Dallas (NPCR/ WHEC-716), ALE sounding at 0426 (PPA-Netherlands).
7535.0	Norfolk SESEF-US Navy, went "green" (secure voice) with unknown vessel, at 1845 (Metcalfe-KY).
7596.0	EK9-Greek military, working GEF, ALE at 2011 (PPA-Netherlands).
7615.0	Mockingbird 4-CAP, unsuccessfully receiving traffic from TN CAP 41, at 1533 (Metcalfe-KY).
7632.0	KOQ 900-US Immigration and Customs Enforcement, FL, SHARES net check in with AFA4YG, USAF MARS, at 1626 (Metcalfe-KY).
7697.0	RC4716, American Red Cross, calling WV mobile unit KNNP491WV, ALE at 2030 (Metcalfe-KY).
7704.0	0360FLCAP-Florida CAP, ALE sounding at 0019 (ALF-Germany).
7720.0	SCC43NG-SC National Guard Weapons of Mass Destruction Civil Support Team (WMD-CST), calling EN875TOC (875th Engineer Battalion Tactical Op Center, AR), also on 9145 and 12087, ALE at 2156 (Metcalfe-KY). [At last some real traffic on this net. -Hugh]
7744.0	VC01, LSB numbers at 0507, 0518, 0543, 0556, 0603, 0605, and 0617 (Boender-Hong Kong).
7822.0	XJN714-SailMail, Lunenburg, NS, Canada, message in PACTOR-III at 0444 (PPA-Netherlands).
7906.0	XVS-Ho Chi Minh Ville Radio, Viet Nam, storm warnings in English and Vietnamese, at 1706 (PPA-Netherlands).
7914.5	HNXW-Unknown station, working 47GW with RTTY test "RY" strings and operator chatter, at 0422 (PPA-Netherlands).

7963.0	ICI05-Italian Coast Guard, Reggio, working IGNT, at 1712 (PPA-Netherlands).	10493.0	B03MECST-ME National Guard WMD-CST, calling T69ME1, ALE at 1516. 0T69ME1-National Guard, calling B01MECST (WMD-CST), ALE at 1804 (Metcalfe-KY).
7980.0	Unid-Probably SailMail KZN508, SC, PACTOR-III message at 2023 (PPA-Netherlands).	10543.0	RCV-Russian Navy Sevastopol, Ukraine, CW navigation warnings in Russian, at 1526 (PPA-Netherlands).
8012.0	Wildwood 11-AR CAP, voice check with Redfire 114 (IN CAP); then 0114INCAP (Redfire) calling 0011ARCAP (Wildwood) in ALE; also on 9047, at 1518 (Metcalfe-KY).	10711.0	Mayport SESEF-US Navy, FL, came from 5745 for Norfolk SESEF, waiting for unknown US Navy vessel, at 1429 (Metcalfe-KY).
8023.0	001CDC536-NY State Department of Health, Albany, voice call WNG 920, ALE text with 010CDCNHQ (WGY9030), at 1529. KTQ313A-US Environmental Protection Agency, NJ, ALE sounding on NPHRN, also on 9414.5, 11485, and 13488; at 1946 (Metcalfe-KY).	10780.0	Cape Radio-USAF, Cape Canaveral Air Force Station, FL, identifying, followed by BRD (Booster Recovery Director) working NASA Booster Recovery Vessel Freedom Star, at 1543 (Stern-FL). [Went to 9270. -Hugh]
8045.0	RAP-Saudi Arabian Airfields Net, working JAP, ALE at 2059 (MPJ-UK).	10945.0	CFH-Canadian Forces, Halifax, NS, usual channel availability marker, but now in STANAG 4285, at 1230 (Terry Netzeley-OH). [Also 5097 and 15920. Dial often reads 1.8 kHz lower. -Hugh]
8058.5	EN875TOC-AR National Guard, calling JOCAR, unknown AR Joint Operations Center, also on 9065, at 2220 (Metcalfe-KY).	10987.0	JDIA-Russian military, duplex CW comm checks with 3BJC, SC4H, OL5P, EDCT, YEZJ, YBMW and TOHT; at 2001 (MPJ-UK).
8071.0	FAV22-French Morse code training station, Faviers/ Vernon, CW drill message in 5-letter groups, at 1833 (MPJ-UK).	11010.0	GWPWZ33-Brazilian Navy, Rio de Janeiro, calling GWPWIN (vessel Independencia), ALE at 1924.
8107.0	XJK-UK DHFCS mobile, calling XSS (control, Forest Moor), ALE at 1840 (PPA-Netherlands).	11033.0	99905-Egyptian MFA, Cairo, Codan data mode with unknown station, at 1845 (PPA-Netherlands).
8122.0	Heimkehr-German sailing yacht Heimkehr, calling vessels Lotus, Kalandia, and Paulinchen, at 2315 (ALF-Germany).	11064.0	RIT-Russian Navy, Severomorsk, working RJP70, CW at 1825 (PPA-Netherlands).
8143.0	KHAIBAR-Pakistan Navy vessel Khaibar (F-184), working TARIQ, Frigate Tariq (F-181), ALE at 1851 (MPJ-UK).	11108.0	FC8FEM-FEMA Region 8, CO, ALE sounding at 0444 (PPA-Netherlands).
8182.0	XJM-Unknown UK DHFCS, ALE followed by data transmission, at 2212. (MPJ-UK).	11155.0	RIT-Russian Navy, calling RGR35 for CW traffic, at 1943 (PPA-Netherlands).
8200.0	MOBILE31-Libyan Great Man-Made River Authority, ALE link check with HQ1 (control, Tripoli) then voice operator chat, finally PSK exchange, at 2055 (ALF-Germany).	11253.0	MVU-UK Royal Air Force Valmet, aviation weather for Middle East, at 0224 (Maltz-NY).
8258.5	Unid-North Korean diplomatic, ARQ traffic with unknown station, at 0611 (PPA-Netherlands).	11342.0	New York-LDOC, Medlink patch for injured crew member on unknown company's flight 787, at 1415. New York-LDOC, working Air Transport 530 (Air Transport International, probable DC-8 freighter), went to 17925, at 1729 (Stern-FL).
8401.0	PWQO-Brazil Navy Hydrographic Vessel Sirius, SITOR-B third-party traffic via "WN" (PWN33, Natal Naval Radio), at 2050 (ALF-Germany).	11418.0	RMP-Russian Navy, Kaliningrad, calling RJP70 and RLA88, CW at 1831 (PPA-Netherlands).
8502.0	NMG-USCG, New Orleans, identifying after weather broadcast, at 0421. NMG, female voice (not "Iron Mike"), high seas forecast at 0517 (PPA-Netherlands).	11485.0	121CDCS27-Possibly MN Dept. of Health, St. Paul, NPHRN exercise ALE with WGY9441, FEMA Auxiliary Station, MI, and 441FEMAUX, same FEMA, at 1537. 010CDCNHQ, ALE text messages to 097CDCS18 and 109CDC40, at 1608 (Metcalfe-KY).
8625.0	FUM-French Navy, Tahiti, very loud STANAG 4285 test loop, at 0550 (Hugh Stegman-CA).	12067.0	Roughneck 12-US military, net with Roughneck 07, 13, and 20; at 2314 (Metcalfe-KY).
8656.0	3061-Turkish Civil Defense, working 3561, ALE at 1957 (MPJ-UK).	12216.0	FC4FEM-FEMA Region 4, GA, ALE sounding at 1958 (PPA-Netherlands).
8764.0	NMN-USCG CAMSLANT, VA, female voice with 24-hour forecast, at 0522 (PPA-Netherlands).	12230.0	XJM-UK DHFCS, working XSS, ALE at 2021. XBX-DHFCS, calling XSS, ALE at 2027 (PPA-Netherlands).
8891.0	Reykjavik Radio-NAT-D, warning Continental Airlines flight COA83 about ash from the latest Icelandic volcano, at 0213 (Ken Maltz-NY).	13089.0	NMN-USCG CAMSLANT, VA, offshore forecast at 2138 (PPA-Netherlands).
8918.0	New York-Caribbean air route control, working Reach 108, USAF C-17A, gave secondary frequency of 11330, at 0129 (Stern-FL).	13092.0	XSV-Tianjin Radio, China, phone patch with unknown vessel on 12245, at 1536 (PPA-Netherlands).
8930.0	DSO 25LJ-Dassault Falcon Service, flight "over London," calling Stockholm LDOC at 1700 (ALF-Germany).	13258.0	"C"-MX, Moscow, CW at 1958 (MPJ-UK).
8942.0	SU0235-Aeroflot flight, HFDL position for Shannon, at 0741 (Lacroix-France).	13312.0	J40-USCG MH-60J helo number 6040, ALE sounding at 2147 (PPA-Netherlands).
8971.0	Fiddle-US Navy, FL, ops-normal from P-3C Wafer 514, at 1957 (Stern-FL).	13315.0	013-HFDL ground station, Santa Cruz, Bolivia, position from 2K0604 (Aerolineas Galapagos/ AeroGal flight 604), at 2155 (PPA-Netherlands).
9003.0	Unid-Royal Jordanian Airlines company LDOC, Amman, calling flight 702, at 1755 (PPA-Netherlands).	13330.0	Nairobi-Kenya Airways company LDOC, working Kenya 112, at 2145 (PPA-Netherlands).
9025.0	523513-USAF Reserve KC-135R Stratotanker number 62-3513, ALE sounding at 1330 (ALF-Germany).	13485.0	AKALN1-Petroleos Mexicanos (PEMEX), Akal Oil Field platform N-1, Bay of Campeche, ALE sounding at 1806 (Metcalfe-KY).
9031.0	Catch Fly-US military, setting up data comms with Befriend, at 1953 (Metcalfe-KY).	13488.0	001CDCS36-CDC, working 010CDCNHQ and 011CDCNHQ with ALE text message regarding traffic for WGY9030, unknown FEMA Region 3 auxiliary, at 1531 (Metcalfe-KY).
9035.0	190019-Unknown USAF, called ADW (Andrews AFB, MD) and AED (Elmendorf AFB, AK), then raised CRO (Croughton, UK), ALE at 1345 (ALF-Germany).	13527.7	"D"-MX cluster, Odessa, CW at 1958 (MPJ-UK).
9067.7	Unid-Egyptian MFA, Cairo, SITOR-A selcal for OOVF (Pyongyang, North Korea), at 1956 (PPA-Netherlands).	13528.1	"A"-MX cluster, Astrakhan/Baku, at 1958 (MPJ-UK).
9086.7	Unid-Egyptian MFA, Cairo, SITOR-A selcal for TVVC (Baghdad, Iraq), at 0344 (PPA-Netherlands).	13568.0	L6A-LA National Guard; call sign's middle number is for FEMA Region 6; calling N2Y, NY Guard in Region 2, ALE at 1532 (Metcalfe-KY).
9091.0	JFERNANDEZ-Chilean Emergency Management, Juan Fernandez Island, also on 9140 and 9150, ALE soundings at 2334 (ALF-Germany).	13900.0	BMF-Taipei Radio, Taiwan, FAX prognostic chart at 2206 (PPA-Netherlands).
9106.0	KNY85-NTCN, TX, calling NCS311, NCS Auxiliary station, ALE at 1702 (Metcalfe-KY).	13927.0	Rama 82-USAF B-1B, attempting patches via USAF MARS AFA7HS (KS) and AFA5QW (IN), too weak for either, at 1430 (Stern-FL).
9164.9	HLL-Seoul Radio, Korea, FAX fishery weather chart at 1854 (PPA-Netherlands).	14422.0	Unid-Egyptian MFA, Cairo, working TVVQ, Khartoum, Sudan, 16-tone PSK at 1658 (PPA-Netherlands).
9200.0	2011-Moroccan Civil Defense, working 2416, ALE at 1736 (MPJ-UK).	14435.0	Unid-Egyptian MFA, Cairo, SITOR-A selcal TVXX to San'A, Yemen, then 16-tone PSK, went to 17433, at 0756 (PPA-Netherlands).
9219.0	K27-Israeli Air Force C-130H number 427 (4X-FBS), ALE sounding at 2039 (ALF-Germany).	14451.0	RJP70-Russian Navy, calling RIT, CW at 1733 (PPA-Netherlands).
9725.0	New Star Radio Station-Chinese music and numbers (V13), Program #4, at 0500 and 0600 (Boender-Hong Kong).	14455.0	KHA925-NASA Johnson Space Center, TX, net with 5 other NASA stations, at 1628 (Metcalfe-KY).
9986.3	Unid-Czech Republic intelligence, Prague, encrypted SITOR-B traffic, at 1839 (PPA-Netherlands).	14484.0	AAA9USA-US Army MARS, net with AAN6DFW, at 1629 (Metcalfe-KY).
10063.0	N647AV-Avianca A319, flight 44, HFDL position for Panama, at 0407 (PPA-Netherlands).	14570.0	FUO01P-French Navy, Toulon, calling 05DGP, ALE at 0720 (Eddy Waters-Australia).
10100.8	DDK9-Deutsche Wetterdienst (German weather office), Hamburg/ Pinneberg, forecasts for Baltic and Gulf of Riga in RTTY (50/450), at 0346 (Stegman-CA).	14582.0	F33-USCG HU-25 Falcon Jet, ALE sounding at 2218 (PPA-Netherlands).
10162.0	3068ARCAP-Arkansas CAP, reporting airport runway conditions to Avenging Spirit (AVS), ALE and voice at 2003 (Metcalfe-KY).	14812.0	Unid-Russian 6-tone selcal (X06) to 246531, repeated for 7 minutes after discovery, at 0917 (Mike-UK).
10255.0	Unid-Vietnamese Numbers Station, male voice with usual "calling Light-house" and number groups in Vietnamese, at 1607 (Boender-Hong Kong).	16804.5	256367000-Malta flag bulk carrier Sofie Bulker (9HSI8), DSC with USCG Miami at 1211 (Lacroix-France).
10366.4	WPUC469-SailMail, Daytona Beach, FL, CW identifier after PACTOR-III message, at 0422 (PPA-Netherlands).	17425.0	RIT-Russian Navy, Severomorsk, calling vessel RGR35, CW at 1734 (PPA-Netherlands).
10404.0	Unid-NATO or US aircraft, PSYOPS loop in English and Arabic telling Libyan government personnel to stand down, at 1202 (Lacroix-France). MOBILE31-Libyan Great Man-Made River Authority mobile, ALE with HQ1 (headquarters and frequency's normal user), at 1856 (PPA-Netherlands). [Also recently on 9376 and 10125. -Hugh]	17435.0	2011-Moroccan Civil Defense, calling 2216 and 2212, also on 16240, ALE at 1320 (MPJ-UK).
		17487.0	NCS311-Unknown NCS asset, ALE with NTCN/SHARES stations KNY95, KNY86, KNY85, and KNY63; at 0124 (Stegman-CA).
		17925.0	New York-LDOC, working Air Transport 530 regarding departure from Patrick AFB, at 1730 (Stern-FL).
		26955.0	13TH2207-German Citizen's Band station, FM voice with 13TH1001/p via unknown Internet gateway in Gottingen, Germany, at 1155 (ALF-Germany).



Russian Diplomatic Traffic

This month we take a look at the various digital guises used by the Russian Diplomatic and Intelligence Services to move traffic around their HF operations.

CROWD36

Probably the most audibly familiar data mode used by the Russians is the MFSK system known as CROWD36, a copy of the famous British Piccolo modem. This mode uses 32 tones in a 10, 11, 11 tone group configuration and sends traffic at 40bd. This mode has a very rhythmic, flute-like quality when you hear it. The spacing between tones is 40Hz. The signal is usually sent at +2080 Hz above the carrier (USB or sometimes rarely LSB) point, but +2000 Hz is also used on some links.

Back in the day, when these modems were mainly human-operated, there used to be frequent operator chatter sent at 10bd where tone 17 (or 24) stood idle during the breaks in traffic. This is seldom heard these days, however, as the modems are usually remotely and automatically controlled. Along with this change also came the development of a more sophisticated error checking and ARQ (Automatic Repeat Request) mode, where the ISS (Information Sending Station) and IRS (Information Receiving Station) can operate full-duplex links.

Also disappearing with the evolution of the modem was the usual 5-letter or 5-figure group off-line encrypted traffic in favor of an on-line encrypted mode. However, the old header remains to this day and can be decoded by the relevant module of the Hoka and WaveCom decoders. These headers start with the group "11177" with the next 5 digit groups indicating the link (circuit) identifier, date/time, group count and other items. As we will see later, this style of message header has been used for a long time by the Russian networks and is common across a number of transmission systems.

Here are some recently active and regularly used channels on which to catch this interesting mode: 12218, 14470, 14655, 14934, 16045, 16342, 16343, 18332, 18738 and 19878 kHz USB

See the Resources section for some audio clips of this famous and instantly recognizable modem.

Baudot

The Russians have also extensively em-

ployed 75bd and 50bd standard Baudot, usually with their trademark 500 Hz shift to move messages around their networks. The use of this mode has declined over the years, but can still be heard on a regular basis.

In fact, during the early and mid-'90s, there was a very active network of these stations using the "11177"-style message header and three-letter calls for the recipients. The network was covered in great detail by the WUN (now UDXF) listeners' forum and was christened variously as "The Brotherhood," SOUD, and later, FAPSI stations, as the Intelligence Service changed its name over the years. Sadly, these are rarely heard now, presumably CROWD36 having replaced them.

A few years ago, however, saw the emergence of a new 200bd Baudot 500 Hz version. Hoka owners might find a module somewhat curiously called "200-450"

that formats the traffic nicely, even though the standard Baudot decoder will do fine. Here is a sample of this new style of traffic:

823 21	25490	33543	38138	160
846 22	76708	17284	12331	117
757 23	42034	56091	64236	148
827 24	90013	07992	37526	85
818 25	73225	61986	92749	147

Messages end with this kind of line:

699 88 74261 00000 +++++ 250

A null message (no traffic available for the recipient – in this case recipient 576) is sent as 5 minutes of a line like this:

576 1 00000 +++++ +++++ 162

There also appears to be another style of traffic sent by the Baudot stations with lines containing ten 5-figure groups with a message break like "100=" at each group of 100. These have been referred to as the "x=" stations by some monitors.

Like the 288 bit stations outlined below, these stations also have a habit of repeating the same message 10 minutes later on a lower frequency.

The 288 Bit System

Appearing in the late 1990s was a new, faster system sending synchronous data at a speed of 200 bd with 1000 Hz shift. The traffic has an ACF (Autocorrelation Function) of 288 bits, indicating the message frame size. To my knowledge, traffic has not been decoded by hobbyists, but I would not be at all surprised if the same underlying "11177" header, 5 figure group style traffic still emanates from the decoder at

the receiving end of the link.

Another thing to note is that these stations behave very much like the family of Morse and voice numbers stations employed by the Russian Intelligence Service. The ENIGMA number station group has assigned the codes G06, E06 and S06 for the German, English and Russian voice versions and M12 and M14 for the Morse sister stations.

Messages usually start on the hour or any 10 minute interval thereafter with a 5 minute call-up phase. If there is no traffic for the receiver, a so-called "null message" is sent for the first 5 minutes, consisting of the recipient's 3 figure identifier and followed by "00000." You can hear the difference between the "I have messages for you" call-up and the "null message" very easily by ear when tuning into these stations.

Once the message is completed, null or otherwise, the station usually moves down by approximately 2 MHz and repeats the whole process at the next 10 minute point. See the Resources section for an example of this modem.

❖ SPO and Friends: Another Mystery

A long sounding burst by an ALE station on 16321.5 kHz USB caught my attention a few weeks ago. The ID was "SPO." This is the same frequency on which another as-yet unidentified ID "DKB" has also been heard. Propagation definitely suggests a US origin and the .5 kHz offset is another common sign of the Army. A few days after this initial hit, a large network of stations using IDs "STATION1" to "STATION12" could be heard, with network control being carried out by "STATIDIACMDNET."

There was much traffic using the MIL-188-110A high-speed modem, all of which was fully encrypted with no sign of any recognizable header or trailer. Best guess so far is that these may be Special Operations stations.

Other frequencies to check include 6911.5, 8050, 9325.5, 10765, 12078.5 and 17460 kHz USB.

That's all for this month. Next time we'll take a look at a new and unidentified PacTOR network. Until then, please keep the letters and emails coming.

RESOURCES

CROWD36 Clip - signals.taunus.de/WAV/CROWD36.HTML

288bd Clip - signals.taunus.de/WAV/RUS-INTEL_200Bd-1000Hz.WAV

The Brotherhood - www.cvni.net/radio/nsnl/nsnl000/nsnl0k.html



ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

Kirk A. Kleinschmidt, NT0Z
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Six Meters: Stealth, QRP, and Newbie Friendly!

On the eve of the 2011 June VHF QSO Party, arguably the premier 6-meter activity day each year, I was helping Kevin, AC0TA, install and test his stack of home-brew Yagis (see Figure 2). Although I hadn't owned a 6-meter radio for several years, I knew in the back of my mind that if conditions were good during the contest, the June gathering would really showcase the band's fantastic and unusual characteristics.

Kevin, a relatively new ham in his mid-20s who got involved in the hobby as a result of TV DXing (and my prodding), had made a scant few QSOs in the year or so since he'd been licensed, but what he lacked in experience, he made up in a much rarer quality: AC0TA is a fearless "builder" who's not afraid to grab the drill, the soldering iron, and a handful of necessary components.

I'm sometimes amused by his trials and tribulations as a home-brewer. As a beginning ham I was also an avid builder, but I was always very concerned about frying delicate components, drilling holes in the wrong spots, etc. Kevin's not reckless by any means, but he has a definite "get 'er done" attitude about making projects happen!

His tower had been up for several months, serving only as a skyhook for his HF horizontal loop and a perch for his massive Gray-Hoverman TV collinear array, and Kevin wanted some VHF+ gain at the tippy-top. He started scouring the internet for design ideas and found several online Yagi design calculators, one of which provided the dimensions for a five-element, 6-meter beam made from the VHF-low elements salvaged from a pile of analog-era TV antennas he'd accumulated.

To ensure success on 144 and 432 MHz, I pointed him to *MT*'s VHF antenna columnist Kent Britain, WA5VJB, whose "Cheap Yagi" designs are as foolproof as beam design can be. And they're ridiculously cheap, too, hence the

name! See www.wa5vjb.com/references.html for more info.

❖ It's RotATors, Guys!

Kevin had been hassling with several ancient (and junky) TV rotators over the years, and I'd been bugging him to get at least one "real rotator" since the moment I saw his ragtag collection of scavenged, weather-beaten TV rotators, most of which were first installed in the 1970s.

The prices of modern antenna rotators haven't kept pace with those of transceivers and most other ham accessories. Towers and rotators are pricey, so it was important to choose wisely.

After a lot of searching and discussing, I seconded Kevin's choice of an older Alliance HD-73, expertly refurbished by the ill-named Norm's Rotor Service. The techs at Norm's have forgotten more stuff about rotators than most of us will ever know, but the company name has always tweaked my editorial DNA!

For the record, automobile disc brakes have rotors, as do helicopters, but antennas have rotators. Period. I'm sure NRS is aware of this, but the periodic rantings of smart alecks such as me are probably not enough to prompt a corporate name change.

If a creaky old Channel Master rotator is a rusty kid's tricycle, a good-as-new Alliance HD-73 is a diesel-powered locomotive.

Getting the antennas squared away took longer than expected, because we had to lower the beams and the mast to the ground after the initial install to fabricate a bearing plate for the top of the tower. Without it there was just too much lateral play, which would probably destroy the rotator and needlessly fatigue the top section of the freestanding tower.

After the final installation, by the time we cleaned up the yard and put the tools away it was 10p.m. local time. I had checked out the 50- and 144-MHz Yagis on the miniVNA (see Figure 3) prior to installing them, so I wasn't concerned about how well they'd work. The 432-MHz Yagi was beyond the miniVNA's frequency coverage, however, so we had to rely on WA5VJB's construction dimensions and the SWR meter in Kevin's FT-897 transceiver. No problem, either way.



Who says beginning hams don't build stuff these days? These home-brew Yagis for 50, 144 and 432 MHz were built by Kevin Adler, AC0TA, of Byron, Minnesota. The 6-meter Yagi was built from a pile of salvaged TV antennas, while the beams for 144 and 432 MHz are Kent Britain, WA5VJB, "Cheap Yagis" (made from hardwood, hot glue and 1/8-inch welding rod!). A refurbished Alliance HD-73 handles rotation chores. The arm near the top of the tower is a skyhook for Kevin's horizontal loop. The antennas, all fed with 75-ohm RG-6 or RG-11, work nicely. See text for more information. Good job, AC0TA! – NT0Z

❖ 6 Meter Ambush

As we fired up the rig, I figured that there'd be plenty of 6-meter ops around the country who'd be at their radios, testing, tweaking and working other locals in anticipation of the QSO Party, which would start early the next afternoon, but I didn't expect that there would be any active propagation for our test.

I was wrong!

Six meters was wide open, something I hadn't seen for several years (not having a 6-meter radio in the interim didn't help much)! As Kevin twirled the beams back and forth, the antenna showed plenty of directivity, and when there was a break in the action, AC0TA called Leo, WY7LL, in Wyoming, with 50 W of SSB from his brand-new, homemade antenna.

Leo came right back, giving Kevin a 59+ signal report. Leo, too, had a whopper signal, and being from the rare state of Wyoming, I imagined that he was running a kilowatt to a long-boom Yagi from a picturesque mountaintop retreat.



Just like the good old days! As shown by the band scope on the FLEX-1500 SDR, during the 2011 June VHF QSO Party, 6-meters was alive and well. Here in Minnesota, K0DU (left, Colorado) and W4TP (right, Alabama) were booming in for hours on end. – NT0Z

Not so! Thanks to the magic of six meters, Leo was running 50 W to his 80-meter dipole!

That fact *really* got my attention, and I immediately started to think that I might be able to work a few stations during the QSO Party with my “compromised,” stealthy setup: 5 W and an attic-mounted 40-meter horizontal loop.

I stayed to help Kevin work a few more stations in Colorado, Montana and Utah, but I secretly wanted to race home to see whether I could get in on the action from my own shack. Although I hadn’t spent a lot of time at 50 MHz, in several previous summers of working tropo and sporadic-E openings I had never worked Wyoming or Montana.

Lucky kid! With 50 W and a home-brew Death Ray Beam at 60 feet, AC0TA – greenhorn and fearless home-brewer – was working stuff in his first 30 seconds on 6 meters that I hadn’t even heard in years of casual operating!

❖ A Friendly Competition

This fact, the great propagation – and my barely suppressed jealousy! – suggested an impromptu, friendly competition. Kevin, the inexperienced up-and-comer with a 100-W rig and a Killer Antenna, would slug it out with Yours Truly, a grizzled veteran with a Puny Power station and a Crappy Antenna.

Although I’m definitely not a world-class contender, I have been slogging through pileups since before Kevin was born. Plus, I could always whip out my secret weapon – Morse code. AC0TA isn’t yet fluent with the dits and the dahs, which also convey a decent signal-to-noise ratio boost when compared with SSB.

Of course, it was a bit of false bravado on my part, sort of like bringing a pocket knife to a wood chipper fight...

Kevin had a 13 dB RF power advantage in addition to 5-10 dB of “aluminum gain,” depending on where his antenna was pointed and the relative direction of my horizontal loop’s many lobes on 6 meters. To offset what would probably be an insurmountable advantage, I had thousands of QSOs, 34 years of experience and a FLEX-1500 SDR receiver that totally crushes the FT-897 under the heel of its tiny, yet iron-soled, boot.

On the Big Day, Kevin and I had been chatting on 50.130 MHz for about 45 minutes before the QSO Party began at 1 PM local time. From 15 miles away I could hear him okay, but I initially thought conditions to be less than stellar. When he pointed the Death Ray in my direction, however, the full effect of staring into the Maw of the Beast was apparent. Wowser! This was going to be an uphill battle...

I had calibrated my station clock to within 0.2 seconds of UTC, and as the first seconds of the QSO Party ticked past like the crack of a starter’s pistol, I switched from chat mode to contest mode, on the fly, like a crazed sports-caster.

“Okay, Kev,” I said, having previously adjusted the FLEX-1500’s TX equalizer, noise gate and speech compressor to squeeze out every last drop of QRP RF goodness, “in about 10 seconds, madness will ensue, so get ready...”

“CQ contest, CQ contest, this is November,

Tango, Zero, Zulu...contest.”

I was expecting AC0TA to reply, as we had been chatting for almost an hour, but NY0V, apparently an old hand at this sort of thing, a few miles to the West of me, beat him to the punch! He had been reading the mail on our conversation and was poised at the key. Even with a massive 23-dB RF advantage, if you don’t press the PTT switch at the right time, someone else will work your station!

Suppressing a chuckle, yet still feeling like a proud Elmer, I worked AC0TA for QSO number two.

First lesson in contesting, Grasshopper? Timing! When you can snatch the PTT from my hand, it’s time for you to leave...

This tingle of self-satisfaction lasted for a few glorious seconds until I remembered my hideous 23-dB RF handicap. Score-wise, Kevin, of course, beat me up pretty badly. Six meters was wide open for most of the weekend contest period, and we both worked stations from coast to coast.

Thanks to youthful exuberance and the Death Ray Beam, on his first casual weekend on 6 meters, Kevin worked 150 QSOs, 80 grid squares, 26 states and two Canadian provinces! That’s 80% of VUCC and more than half of Worked All States on Day One! AC0TA also made 28 QSOs on 2 meters in 7 grids, plus a few Qs on 432.

I’d call that an *awesome* introduction to the Magic Band.

As for me, the grizzled veteran running QRP to an indoor HF antenna, I worked 54 QSOs, 42 grids, 20 states and VE2. I couldn’t best Kevin, but I was very happy with my results. Happy enough that I now monitor 6 meters regularly, listening for band openings, ready to pounce with my QRP 6-meter signal.

During a brief, but powerful pipeline to NY and CT, I managed to work Noted VHF Authority Emil Pocock, W3EP, near Newington, CT (a former coworker from my *QST* days in Newington), and I heard Bill Tynan, W3XO/5, from the Hill Country of Texas, although I wasn’t able to work him. Yes, I’m a grizzled veteran when compared to AC0TA, but W3XO is a Real Deal Grizzled Veteran when compared to me! A past AMSAT President and prolific ham radio author, Bill was working 6 meters before I was born – and way before the modern era of compact, inexpensive dc-to-daylight transceivers.

So, what did we learn from our friendly competition?

We learned that six is beginner and QRP friendly; that almost anyone can build a suitable 6-meter antenna; that indoor antennas work, too; that simple, wire antennas cut for other bands can work on 6; that many inexpensive transceivers made during the past 15 years feature 6-meter coverage; that you, as beginning or experienced operator should at least test the waters; and that 6-meter operating – especially during contests, Field Day and times of enhanced activity – is a lot of fun, regardless of your gear and experience level.

Because I’m running out of space, I will have to cover the nuts and bolts of 6-meter operating, including portable operation and

hilltopping, in a future column. In the meantime, get busy with your due diligence. Six-meter propagation tends to be best in the summer and fall, and there are VHF contests and operating events just around the corner.

See you on six!

RESOURCES

6 Meters in General - www.smirk.org
www.qsl.net/n3db/Linkpage.html
Worldwide Beacon List - www.keele.ac.uk/depts/por/50.htm
VHF Propagation - www.anarc.org/wtfd/propagation.htm
Tropo Forecast Maps (amazing!) - www.dxinfo-centre.com/tropo.html
Grid Square Map of USA - www.k0nr.com/Files/usgridsq.pdf
Grid Finder from Google Maps - <http://f6fvy.free.fr/qthLocator/fullScreen.php>

“TELE” ELMER

Veteran ham instructor and author Gordon West, WB6NOA, has just released his 2011-2015 General Class Study Manual. In addition to covering the entire Element 3 question pool in great detail, purchasers get a welcome and unexpected bonus – the author, affectionately known as Gordo – as a “telephone Elmer!”

“I receive five to ten phone calls a day,” says West, “from students preparing for exams and from recent graduates who have passed their licensing tests.” His personal phone number is mentioned many times throughout the book, so getting connected isn’t difficult.



Says Gordon, “My free consultation service can lead students through tricky math formulas for Extra-Class and Commercial exams, as well as one-on-one discussions about simple antenna projects.”

The book, priced at \$24.95, includes Gordo’s “On the Air!” audio CD that introduces readers to HF operations and General-Class privileges.

In today’s era of overseas phone centers and online-only “self-help,” it’s nice to know that your license guide purchase is backed up by expert telephone support. You can check out the new General Class Study Manual and the rest of Gordon’s training materials at www.gordonwestradioschool.com.



GETTING STARTED

THE BEGINNER'S CORNER

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Postscripts and Addenda

Throughout the course of the year I've written columns and articles on various aspects of radio in this magazine that led to response from some readers. In addition, I was struck by a number of things that have happened lately that relate to some of the topics from those writings. It sort of proves that nothing stands still, which is why it's harder to shoot fish in a barrel than many would suggest. So, here's an update.

❖ Sirius/XM Settles Lawsuit

For years I have ragged on the satellite radio monopoly Sirius/XM for a number of issues. I've been a subscriber since the beginning and feel the company could do a lot better for its listeners instead of always looking out for the shareholders and CEO Mel Karmazin's endless well-being. So, you can imagine how happy I was to see an email in my inbox addressed to me from someone called "Satellite Radio Class Action Administrator."

Of course, I opened it immediately and liked what I read: "If You Subscribed to Sirius, XM or Sirius/XM Radio You Could Get Benefits From a Class Action Settlement." Yes! Now they had my attention!

I was encouraged to go to a web site (www.satelliteradiosuit.com) and read on. "There is a class action lawsuit (*Blessing v. Sirius XM Radio Inc.*) against Sirius XM concerning the July 28, 2008 merger that created Sirius XM. The lawsuit claims this merger violated federal antitrust laws and that Sirius XM raised its prices as a result of the merger." I thought, "Now, we're getting somewhere!" It wasn't long before I was daydreaming of early retirement to a DX paradise with a 2012 Prius Plug-in Hybrid filled with exotic radio apparatus. But, the next sentence was ominous, "Sirius XM denies it did anything wrong." Huh?

The next couple of paragraphs go on to explain what the various things Sirius and/or XM or both didn't actually do, and which now, through the miracle of a court order, are suddenly available to me. The notice ends with, "The estimated value to the Class of the Settlement is approximately \$180 million." I thought, "Hmmm. That really is big. That's nearly two years of Howard Stern's salary! Boy, this outfit is going to take a real hit." Then I read the next part which goes against the common prejudice that lawyers are without a sense of humor. It's

what's known in comedy clubs as the punch line: "The Settlement does not provide for cash payments to Class members." Yes, very funny.

What exactly do Class members get? As part of the Settlement Sirius/XM states that they will not raise their subscription rates until the end of this year. That's a settlement? Rates will not go up for multi-radio subscriptions or for Internet streaming. And, subscribers can lock in their current rate if they renew by the end of the year and they may keep that rate for the duration of the term they choose.

While it sounds more like an ad campaign than a settlement, I guess that's the good news. The bad news is that 2012 will probably see a record rise in subscriber fees, extra-radio subscription fees, on-line listening and U.S. Music Royalty fees. Let me be the first to say, "Happy New Year!"

❖ TV/FM DXing

MT reader and professional broadcaster David Alpert wrote recently about a column I did on the return of the portable TV in the April issue. He notes: "Not sure you've ever referenced these websites dealing with digital TV in MT. One is www.rabbitears.info. Useful for what I've found to be an accurate, up-to-date list of all the channels and subchannels in a given market. There is also a "DX Tool," currently in public beta. The other is www.tv-fool.com. That site provides an estimated idea of what you can receive OTA with an outdoor antenna at a given location. I can get almost everything it says I should on rabbit ears."

Thanks, David! Both are excellent sites especially for cross-referencing call signs with channel or frequency readouts. One interesting aspect is how the list does or does not change when the antenna height is changed, say from 30 feet to 60 feet. If you thought you were going to improve reception dramatically, the list shows you won't. The main reason is the nature of line of sight FM and TV transmissions. Now, if you had a really substantial increase, say at the top of a 1,500 foot mountain, things would be a lot different.

❖ Mobile Shortwave Listening

Last month I detailed all the possible ways to listen to shortwave stations in your car. Among the ways was via in-dash AM/FM/SW radios, of which only the Becker Mexico BE2340 was available. I mentioned

that the supplier had only one in stock and before the issue hit the stands it was bought by an MT reader, Len WA2AMW, who works at the Princeton Plasma Physics Laboratory. He sent an email saying he was thrilled to get the radio and looking forward to putting in his car. Len could be the last person to buy a new-in-the-box, in-dash, shortwave radio in North America. Congratulations, Len!

❖ Attached to the Loop

Ronald Erickson K0IC wrote recently regarding the horizontal loop I described in this column in the June issue ("Loop Your Way to HF DX Success"). I mentioned the antenna was made of aluminum wire commonly used for electric fences and available quite cheaply at your local Tractor Supply Company store. Ronald wanted to know how I attached the aluminum wire without soldering.



Unadilla 4:1 balun has pigtails to connect to your loop with standard wire nuts. (Courtesy: Universal Radio)

Well, it's a great question! It seems that I forgot to mention in the text that I attached the two ends of the loop to the wire pigtails from the Unadilla W2AU 4:1 balun (\$29 from Universal Radio) with normal house wiring nuts. You can do this with ladder line as well.

And, here's another tale from the world of the horizontal loop: The other day I was tuning around the 40 meter band and heard a ham asking for signal reports. He was a good 5-9 on the meter of my trusty Kenwood TS-140s at my location and he gave my report as 5-9 plus 10 to 20 dB over. He was over 300 miles away running 900 watts into a wire dipole. I was running one tenth the power into the loop.

Case closed! Loops not only put out great signals, but you can do so without the expense of a power-guzzling linear amplifier.

❖ Shortwave Pirate Monitoring

The HF bands are peppered with unauthorized transmissions. From spooky numbers stations to incomprehensible 11 meter outlanders; from big international operators such as China Radio International popping up on the ham bands, to wacky homegrown U.S. shortwave pirates. There are plenty of unidentified transmissions to keep HF band-hoppers happy.

But all has not been ho-ho-ho and a bottle of rum with HF pirates. This past winter there was an ongoing feud between various factions that saw on-air frequency-poaching that led to online blog-sniping that had many veteran HF pirate fans shaking their heads and wondering, "What next?"



Radio Casablanca QSL (Courtesy: Author)

Well, the next thing was the disappearance of WEAK Radio as described in this month's *Communications* column. Then there was the disaster of the outbreak of tornadoes in the Midwest which apparently leveled the server site for the Free Radio Network (www.frn.net), host of the most authoritative source of information about North American HF pirates. By the first of June the site was back up.

The good news for SWLers is that the HF bands are still active with the audio artistry of pirate radio, but how do you tell the players without a scorecard? Luckily, there's a new edition of Andrew Yoder's definitive book, the 2011 edition of the *Pirate Radio Annual*. The price is \$16 plus \$2.50 shipping (U.S.) from Cabinet Communications, P.O. Box 109, Blue Ridge Summit, Pennsylvania 17214.

The book details 161 North American and 13 European pirate stations, covers 184 pages, and includes black and white reproductions of many pirate radio QSL cards. The book comes with a CD featuring audio clips of 84 stations, most of which were from 2010 broadcasts.

Since many HF pirates QSL via email (the addresses of which are up to date and listed in the *Annual*), it's a must-have for all pirate radio fans.

❖ CRI Strikes Again

In the January issue of *MT*, I wrote a feature titled "China's Global Electronic Reach" which detailed the stealthy way China Radio International has insinuated itself into local radio



CRI's Music Safari host Neal Jones rocks Washington, D.C. for CRI in afternoon drive time. (Courtesy: CRI)

markets across the U.S. The brilliantly simple tactic is to buy struggling AM radio stations near major U.S. markets; upgrade the transmitter and antenna; change the call sign and introduce CRI's English service to the local population. At the time that piece was written, CRI had taken over the full-time programming of AM stations in Galveston, Texas, Honolulu, Hawaii and Tijuana, Mexico, with regularly scheduled broadcasts on stations in six other U.S. markets.

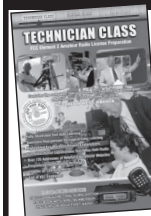
This year CRI struck gold when they were able to resurrect a locally much-loved but dormant AM station in Leesburg, Virginia: WAGE-AM 1200 kHz. Through a series of spectacular dance steps with FCC licensing that took more than two years to complete, the station changed its call sign to WCRW (as in, let's say, "China Radio Worldwide?"), upgraded the transmitter to 50,000 watts (maximum allowed in the AM band), changed the transmitter site to accommodate three towers, and moved to 1190 kHz. These moves were completed in mid-April of this year when the station hit the air with a signal big enough to cover all of the Metro Washington, D.C. market.

Among the instructive aspects of this particular case were the statements made by station officials in the lead-up to the station's return to the air, which indicated that a rising Asian population in the area called for more international programming. Possibly, but it's hard to imagine that such a population would be interested in listening to CRI's English service with its "Intro to Chinese Culture" programming. More likely the actual target audience members are among the millions of English speaking Americans in Virginia, Maryland, West Virginia, and the District of Columbia that the signal now covers.

According to an article in the *Washington Post*, WCWR President Alan Pendleton was quoted as saying, "We still want to do things that appeal to Loudoun County," he said. "We're not abandoning Loudoun by any stretch of the imagination."

I stumbled onto this station while cruising the AM band on a typical Friday afternoon. What initially caught my attention was the huge signal and Chinese language program. Listening to the station for several hours while writing this column I heard only CRI programming, interrupted briefly for "weather and traffic" and odd bits of local news. Programming was from CRI's *Beyond Beijing* line-up. <http://english.cri.cn/beyondbeijing/index.htm>

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Take Me Out to the Ballgame

This month we shine the *Programming Spotlight* on sports and the people who bring it to us on radio, and on some innovative comedy programming. When discussing the local sports teams, I sometimes wonder whether they fit under sports or comedy!?

I grew up hearing family stories about gathering around the radio to listen to hockey and baseball games; in fact I heard the stories so often I'm almost convinced that I was there. In the 1930s, my grandfather would listen to Toronto Maple Leafs games on the radio. He was a heavy smoker at the time. He also used to have to hold on to the antenna to get better reception. My mother loves to paint a word picture of the aftermath of a Toronto goal. My grandfather would jump up, shouting "Hooray!" My mother and her family would scramble to grab the radio and the ashtray before they both went flying!

My uncle also told me stories about listening to baseball games featuring Dizzy Dean, Babe Ruth and other immortals of the game. He recalled listening to the longest Stanley Cup game in NHL history, when Mud Bruneteau of the Detroit Red Wings scored in the 6th (!) overtime period to give them a 1-0 victory over the Montreal Maroons, sending Detroit to the first of its 11 championships.

Fast forward to the 1970s when as a lad I became a fan(atic) of the Toronto Maple Leafs. In those days only two games per week were shown on television, so I would tune in whenever possible (that is, when my mother let me stay up!) to listen to games on the radio.

I was slower to embrace baseball. When the major leagues came to Canada, I would watch the odd Montreal Expos game on television, and even when the Blue Jays arrived in Toronto, it was more of a novelty. Around 1979, I began to listen to a game or two each week on CING-FM 107.9 in Burlington, Ontario, a station I was absolutely addicted to – one of the only oldies stations on the dial at the time. These early games on the radio drew me to the game.

The Blue Jays finally climbed out of the cellar after several dismal seasons and started building a young core of players that would take them to the playoffs for the first time in 1985. For the next 10 years I would hang on every word of **Tom Cheek** and **Jerry Howarth** as they described pitch-by-pitch and play-by-play every Toronto Blue Jays baseball game, culminating in two World Series championships. While most people saw the final play of the 1993 World Series on television, **Tom Cheek's** radio call of Joe Carter's walk off home run in Game Six has been played over and over, ingrained in the local collective memory: "The Blue Jays have won it! The Blue

Jays are World Series Champions! Touch 'em all Joe, You'll never hit a bigger home run." I still get chills hearing that, no less so since **Cheek's** tragic death from cancer a few years ago. www.youtube.com/watch?v=U7i7efpX4HQ

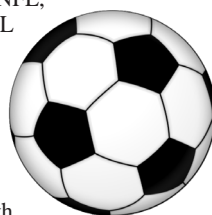
It was an exciting time to be a baseball fan in Canada. I'm sure any baseball (or sports) fan can relate. Whether you are a fan of the Yankees, Red Sox, Dodgers, Cubs or any of the other 25 major league teams, the radio play-by-play teams paint the pictures in our minds and put us in the parks. The really good ones can make you smell the grass, taste the hot dogs, feel the sunshine and see the outfielder gracefully glide across the field to snag a long lazy fly ball, or see the second baseman dive and snag the ball to start a double play.

Men like **Tom Cheek**, **Ernie Harwell** and **Harry Carey** brought games to life in the theatre of my mind for 30 years. There is nothing quite like listening to a ball game on the radio.

In the 1980s, I would often listen to the powerful shortwave transmitters of the **American Forces Radio and Television Service**. During baseball season, **AFRTS** would broadcast baseball games from all over the continent, often giving one the opportunity to hear local broadcasters from cities far away, cities that one could never hope to hear even with a good DX opening. **AFRTS** is still around but the tiny SSB transmissions are a tough catch. Still, you will find lots of sports programming and they still carry games (I listened to a Raptors basketball game on **AFRTS** a few years ago). Give it a shot on 12133.5, 7811.0 and 5446.5 kHz day and night.

One can also sign up for **Major League Baseball Gameday Audio** (\$19.99 per year) and listen to any Major League baseball game, anywhere, and in some cases, in alternate languages such as French or Spanish. I'm not sure if it's still the case, but during Spring Training this service used to be free. For those who are both radio fans and baseball fans it is a great opportunity to hear different play-by-play voices from across the continent. Check it out at <http://mlb.mlb.com/mediacenter/> There are also hundreds of minor league teams across the continent. Often with a quick Google search, one can snag audio of their games, too.

While baseball, the NFL, the NBA and the NHL dominate the sports scene in North America, in the rest of the world, soccer or football is king. This would be the brand of football where the players actually touch the ball with



their feet. In the coming months, sports coverage abroad will be focused on football in a big way. Countries are busy qualifying for the big European championship tournament (Euro 2012) which will be jointly hosted by Poland and Ukraine.

In addition, the London Olympics are not that far off and the hype is starting to build for that particular event, too.



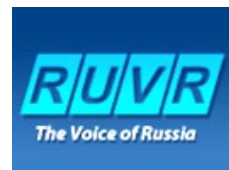
Polish Radio External Service has added a program called *Offside!* As a host country for Euro 2012, stories are dominated by coverage of preparations for the tournament and FIFA news (FIFA is the world governing body for soccer) but other sports are featured, as varied as basketball, kite surfing (!) and rally driving.

One can listen to the programming on demand at www.thenews.pl/1/3/Tematy/96955 One can also try listening on shortwave, on 11675 and 11980 kHz at the end of UTC Friday broadcast at 1200 UTC.

Another relatively new program is **Russian Sports Daily** from the **Voice of Russia**, Tuesday-Saturday at 0142 UTC (9800, 9665 kHz), Sunday at 0205 UTC (15425, 7440 kHz). On this program one will find coverage of a wide variety of sports from the obligatory football, to gymnastics, hockey and many more. One can also listen to past programs (and read the scripts) online at http://english.ruvr.ru/radio_broadcast/36560725/

Voice of Russia has had an increased focus on sports in the run-up to the 2014 Sochi Olympics in Russia. And like other nations in Europe, they are gearing up for Euro 2012 and London. The then **Radio Moscow** introduced the **Radio Moscow World Service**, and the **Russian By Radio** program in the lead-up to the 1980 Olympics hosted in Moscow.

Although it is called **Sports Report**, **DW's** contribution to the genre is all football all the time, which makes sense as Germany is one of the dominant football powers of the world. Occasionally other sports such as Grand Prix racing sneak





in; perhaps in other seasons non-football stories dominate.

New episodes can be heard online every Sunday, at www.dw-world.de/dw/0,,3133,00.html?id=3133 Once you get to the **DW Media Center**, past episodes can be heard as well, a useful feature if you miss a program. You might be able to hear the program on shortwave to Africa, during the 2100 UTC transmission. Try 9735, 11865, 15275 and or 15640 kHz.

While we are looking at Football coverage, **Radio Australia** brings you *World Football Weekly*, wherein each week "The Four Diegos bring you the latest from the colourful and bizarre side of world football" You can snag the podcast at www.abc.net.au/ra/podcast/worldfootball-weekly/podcast.xml

CLASSIC COMEDY AND NEW LAUGHS

The Goon Show - BBC Radio 4 Extra

2011 marks the 60th anniversary of the debut of *The Goon Show* on BBC Radio. This was the program that introduced the world to the talents of **Peter Sellers** and **Spike Milligan**, to name just two. To say *The Goon Show* was off the wall is an understatement. Nothing quite like it had ever been heard on radio in the United Kingdom, let alone the world. *The Goons* combined slapstick, word play and general insanity into one of the funniest productions to ever air on radio. *The Goon Show* laid the foundation for programs such as *I'm Sorry I'll Read That Again* and *Monty Python's Flying Circus*.

In honor of the 60th anniversary of the show, **BBC Radio 4 Extra** (formerly **BBC Radio 7**) aired a number of special programs at the end of May. These included **Eric Sykes** - *The Radio Years* in which Sykes recounted his career in radio, including his role as a *Goon Show* writer, *Goon Again*, a re-recording of the original script (done in 2001 for the 50th anniversary), *The Last Goon Show of All*, a recording of the 1972 reunion of the *Goon Show* cast for the BBC's 50th anniversary that year. And of course they played their usual weekly *Goon Show* episode.

BBC Radio 4 Extra is a treasure trove of archival material. Very often programs such as the *Goon Show* specials get repeated several times per year. **BBC Radio 4 Extra** sends out a weekly e-mail newsletter, with highlights of that week's upcoming programs. There is a link to the newsletter at www.bbc.co.uk/radio4extra/ along with the obligatory Facebook and Twitter links. Or as I do, you can poke through the daily schedules and make note of what's coming up. And, as everything is archived, you can go back up to 7 days in case you miss something.

24/7 Comedy Overnight - CFRB/CFRX

With apologies to *Monty Python*, "and

now for something completely different"... **CFR-BCFRX**, (1010 kHz/6070 kHz) in Toronto has been noted with programming from

<http://247comedy.com>. From local midnights (0400 UTC) Monday to Saturday, one can hear 5 hours of stand up comedy. As Toronto is relatively local for me, I've been listening off and on. So if you tune to 6070 kHz while meandering across the 49 meter band or chance upon 1010 kHz while medium wave DXing, and hear Jerry Seinfeld or some other comedian, you've probably found **CFRX/CFRB**.

If you are into stand up comedy it's a good listen, but it doesn't hurt to tune down the dial to **900 kHz** (**CHML** Hamilton, Ontario) and listen to the classic old radio shows like *Burns and Allen*, *The Great Gildersleeve*, and of course, *Jack Benny* around 10 or 11 pm Eastern (depending on when the ball game ends). www.900chml.com/

Before leaving the topic of **CFRB/CFRX**, the station bills itself as «**Newstalk 1010**». It has been branding itself increasingly as "**In Depth Radio**," something to look for as you seek that elusive station ID in the wee hours. **CFRB** is one of Canada's heritage stations, with a lineage going back to the 1930s. The talk programming through the day leans to the right, but not exclusively. I've heard them skewer politicians of both the right and the left - but only when they deserved skewering.

On a recent afternoon, talk centered on lewd tweets by a US congressman and efforts to talk Toronto's right wing mayor into walking in the local Pride Parade. It's an engaging lineup. **Mike Bullard** is/was a stand-up comic with rapid fire wit. **Jim Richards** should have been a stand-up comic, he may just be the wittiest man on Canadian radio. **John Tory** is a thoughtful ex-politician who brings a unique perspective to political discussions. Toronto's news and talk via medium wave, shortwave and the internet at www.newstalk1010.com/

LOL - CBC Radio One



CBC

radio one

Getting back to our discussion of stand-up comedy, *Laugh Out Loud* is **CBC Radio One's** weekly program featuring the best of Canadian comedy. The program can be heard weekly on Saturdays at 630 pm local, and Thursdays at 2pm local. Hosted by **Craig Norris**, one can hear stand-up from comedians with international acclaim (Andrea Martin) and those on their way up (or maybe down). Most programs have a theme, one near Valentines Day focused on relationships; others are from comedy festivals from across the country.

Most of the humour is G or PG rated; occasionally a word might get bleeped.

The program has a website, through which one can listen to episodes going back to Febru-



ary, subscribe to a podcast, access a comedy blog and of course contact the program. There is also a weekly comedy trivia contest, where the lucky winner gets a *Laugh Out Loud* coffee mug. Check out the website at www.cbc.ca/laughoutloud/ Listen live on the **CBC Radio One** network in Canada and US border states, or online, by choosing the **CBC Radio** stream of your choice at www.cbc.ca/radio

PIRATE RADIO SHIP NOSTALGIA

Thanks to a chance discovery on Facebook, I came across the website <http://nigelharris.net> It seems to be a work in progress with and potentially interesting content.

From the "About Me" page: "As both Nigel Harris and Stuart Russell [*two Radio Caroline personas-ed*] I was with **Radio Caroline** as part of the late seventies team on the *Mi Amigo* and on the *Ross Revenge* in the eighties and nineties.

"I stayed with **Radio Caroline** for many years becoming the very last programme controller when the ship was still at sea. After a trip to Israel and the **Voice of Peace**, I joined **Invicta Radio** in Kent followed by **KMFM** and am still a regular presenter for **Radio Caroline** on land."

There are also some neat audio clips, video clips, photos and stories about the pirate radio ships off the coast of the UK, by someone who was there. Mr. Harris has also written a book about his experiences, called *Ships in Troubled Waters*, which he is selling through his website as well. It will be interesting to keep an eye on this one, if you have an interest in the British offshore pirate radio scene.

NASB

National Association of Shortwave Broadcasters

Representing the privately-owned shortwave stations in the USA

• Find links to all of our members at www.shortwave.org

• Take the NASB Shortwave Listener Survey and get a free subscription to the NASB Newsletter. www.surveymonkey.com/s/6LRVL7

• Listen to "The Voice of the NASB" on HCJB's DX Party Line on WRMI's 9955 kHz. Visit www.wrmi.net for schedule

• NASB is a member of the HFCC (High Frequency Coordination Conference) and the DRM (Digital Radio Mondiale) Consortium

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

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http://mt-shortwave.blogspot.com

Twitter @QSLRptMT



Palace and Lighthouse QSLing

Radio Romania International continues their popular *Romanian Castles* QSL card series throughout 2011. Two past favorites have included *The Cotroceni Palace* and *The Cantacuzino Palace*. Each month, RRI features a color painting reproduction to complement your collection. RRI's complete summer broadcast schedule is included in *MT's* frequency guides. Station website www.rri.ro.

Each August, amateur radio operators follow the lure of operating from maritime lighthouses worldwide via the amateur radio bands. This year's International Lighthouse Lightship Weekend will be conducted from 0001 August 20 to 2359 August 21, 2011.

The annual ham radio event came into being from the Scottish Northern Lighthouses Award Weekend, first held in 1994. The Sunday

date now coincides with International Lighthouse Day, when the International Association of Lighthouse Keepers arranges for as many world lighthouses as possible to be open to the public. For more information on this event, consult their website at <http://illw.net>. Shortwave radio listen-



ers can participate in this event and send reception reports to these stations to receive a QSL.

One of the U.S. amateur radio stations that has announced that they will be participating in this year's event is *International Lighthouse-Lightship Fire Island Lighthouse Station*, operating from the historic lighthouse on Fire Island, New York. Visitors are welcome to tune-in or visit the station to observe operators talking to other lighthouses around the globe.

Operations will begin on August 20, from 1100-1800 UTC, operated by W2GSB/LT, Ocean Beach, New York and the Great South Bay Amateur Radio Club. Activity on will be on 14.255, 14.070, 7.175, and 3.850 MHz. A Certificate QSL is being offered. Send your contact details to: W2GSB Lighthouse, PO Box 1356, West Babylon, NY 11704.

MEDIUM WAVE

COLOMBIA

HJUU, 950 kHz AM. Armonías Boyacenses, Tunja, Colombia. Full data E-QSL from John Rubio, "El Kapitan Vallenato," Locutor. Received in one day for a Spanish e-report to: jhonrubiovallenato@gmail.com (Mauricio Molano, Spain/playdx/IRCA).

HJXZ, 1560 kHz AM. Santa María de la Paz Radio, Medellín. Colombia. Full data E-QSL from Equipo Humano Santamaría de la paz. Received in one day for a Spanish e-report to: oventes@santamariadelapaz.org (Molano).

USA

KRLD, 1080 kHz AM. News-Radio. Partial data verification on station letterhead, signed by Jake Springer, Programming Assistant. Received in 13 days for an AM report and \$1.00US (returned). Station address: 4131 N. Central Expressway, Ste. 1200, Dallas, TX 75204-2102 USA (Bill Wilkins, Springfield, MO). Streaming audio <http://dfw.cbslocal.com/>

KUDL 1660 kHz AM Radio Bach. Partial data verification letter, signed by John C., Morris, Assistant Chief Engineer. Station call sign KUDL was former call KXTR, effective March 31. Received in 12 days for an AM report, \$1.00US and address label (used). Station address: 7000 Squibb Rd., Mission, KS 66202-3233 USA (Wilkins).

KWDP, 820 kHz AM, Waldport, Oregon. E-QSL from David Miller. Received in six hours for an AM e-report to info@kytefm.com. Also owns KBCH 1400 Lincoln City and KNPT 1310 New Port, plus three FM stations (Patrick Martin, Seaside, OR).

KWOS 950 kHz AM News Radio. Full data prepared card, signed by Warren Kretch, Program Director. Received in 10 days for an AM report. Station address: 3109 S. 10 Mile Dr.,

Jefferson City, MO 65109-1012 USA (Wilkins).

Streaming audio www.kwos.com/

WBAL 1090 kHz AM. No-data letter signed by Edward Kiernan, VP/General Manager. Received in 16 days for an SAE and \$1.00US. Station address: 3800 Hooper Avenue, Baltimore, MD 21211 USA (Frank Halaburak, Montreal, Canada). Streaming audio www.wbal.com

PAPUA NEW GUINEA

Wantok Radio Light, 7325 kHz. Station slogan, *Proclaiming the name of Jesus Christ over the airwaves*. Date/frequency card of satellite dish/staff photo, signed by Rebecca Dango, Administrator. QSL address: P.O. Box 1273, Port Moresby, N.C.D. Papua Guinea (Dave Valko, PA/Cumbre DX). Email: info@wantokradio.org Website www.wantokradio.org

PHILIPPINES

Radio Veritas Asia, 15350 kHz. 15350 kHz via Santa Maria di Galeria, Vatican City transmitter. Full data 15 Languages card except for requested site notation. Received in 59 days for a CD Mp3 postal report with return postage. Station address: P.O. Box 2642, Quezon City, Manila 1166, Philippines (Kusalik). Streaming audio www.rveritas-asia.org

UTILITY

600 Meter Experimental Beacon, WD2XSH/7 Natchitoches, Louisiana, 508.9 kHz, 200 watts. Full data professionally printed QSL card, signed by Ralph Hartwell W5JGV and three-page info letter. Received in 31 days for a utility report and SASE. QSL address: c/o Ralph Hartwell W5JGV, 641 Sission Road, Natchitoches, LA 71457-6743 (Jim Pogue, Memphis, TN).

Non-Directional Beacon, YGV Havre St. St. Pierre, QC, Canada, 344 kHz, 25 watts. Full data prepared card returned as verified, signed by Benoît Bannon. Received in 13 days for an English utility report, SAE and \$2.00US. QSL address: Opérations Techniques, Aéroport Internationale Jean Lesage, 515 rue Principale,

Sainte-Foy, Quebec G2G 2TB Canada (Pogue).

Non-Directional Beacon, SYS Stoystown, Somerset, PA, 209 kHz, 25 watts. Full data prepared QSL card returned as verified, signed by David Wright. Received in 27 days for an English utility report, SASE and \$ 2.00US. QSL address: Somerset County Airport, 159 Airport Lane, Friendsen, PA 15541 USA (Pogue).

Non-Directional Beacon, F8 Victorville, Quebec, 384 kHz, 17 watts. Full data prepared QSL card returned as verified, signed by Gerart. Received in 11 days for a French utility report, SAE and \$2.00US. QSL address: Louis Provencher, Aéroport Andre-Fortin, 402, Rte de l'Aéroport, Victorville, Quebec G6T 0R5 Canada (Pogue).

ADDITIONAL ACTIVITY REMINDERS

Navajo Code Talkers Day

August 12-14, 1400-0000 UTC. N7C, Window Rock, Navajo Nation, Arizona. Navajo Amateur Radio Club. 20/40 meters, 14.265, 7.265. QSL: Herbert Goodluck, N7HG, PO Box 3611, Window Rock, AZ 86515 www.qrz.com/db/n7c

National Parks Service establishment on August 25, 1916

Aug 27, 1500-2300 UTC. W7SVD, Coronado National Memorial, Arizona. Sierra Vista Contesting Group. SSB 7.225, 14.275, 21.285, 28.350 CW 7.050, 14.050, 21.050 PSK31 7.035, 14.070, 21.070 JT65 7.076, 14.076, 21.076. QSL: W7SVD, 1955 Santa Teresa Dr, Sierra Vista, AZ 85635. W7SVD/P operating from Montezuma Pass high in the Huachuca Mountains of southeast Arizona. W7SVD.net

Hollenberg Pony Express Station Festival

Aug 28, 1400-2100 UTC. KOASA, Hanover, Kansas. Crown Amateur Radio Association. 18.085 14.245 14.045 7.045. Certificate QSL. Crown Amateur Radio Association, 11551 W 176th Terrace, Olathe, KS 66062. www.arlmidwest.org/ponyexpress.html

How to Use the Shortwave Guide

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af
 ① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

FIND THE STATION YOU WANT TO HEAR

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC time on ①, then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not daily, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes	
s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages
USB:	Upper Sideband

CHOOSE PROMISING FREQUENCIES

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and MT readers to make the Shortwave Guide up-to-date as of one week before

print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas

af:	Africa
al:	alternate frequency (occasional use only)
am:	The Americas
as:	Asia
ca:	Central America
do:	domestic broadcast
eu:	Europe
me:	Middle East
na:	North America
pa:	Pacific
sa:	South America
va:	various

Mode used by all stations in this guide is AM unless otherwise indicated.

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to ...

BCL News, Cumbre DX; Hard-Core DX; DSWCI/DX Window; DBS 2011; DX Mix News WWDXC/BC-Top News.

Alokesh Gupta, India; Babcock; Evelyn Marcy, FL/WYFR; Nigel Holmes/R Australia; Ivo Ivanov, Bulgaria; Rachel Baughn/MT; Ron Norton/IRRS; Sean Gilbert, UK/WRTH; Wolfgang Büeschel, Germany.

SHORTWAVE BROADCAST BANDS

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

- Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.
- Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.
- Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide.
- Note 4

"MISSING" LANGUAGES?

A **FREE** download to MTXpress subscribers, the online MTXtra Shortwave Guide is 115+ pages of combined language schedules, sorted by time. Print subscribers: add the MTXtra SW Guide to your subscription for only \$11.95. Call **1-800-438-8155** or visit **www.monitoringtimes.com** to learn how.

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000 0030	Egypt, Radio Cairo	6270na	
0000 0030	USA, BBG/Voice of America	7555as	
0000 0045	India, All India Radio/External Service	6055as	
	7305as	11645as	13605as
0000 0057	Romania, Radio Romania International	7385na	
	9580na		
0000 0058	Germany, Deutsche Welle	9885as	13780as
0000 0100	Anguilla, University Network	6090na	
0000 0100	Australia, ABC NT Alice Springs	4835do	
0000 0100	Australia, ABC NT Katherine	5025do	
0000 0100	Australia, ABC NT Tennant Creek	4910do	
0000 0100	Australia, Radio Australia	9660pa	12080pa
	13690pa	15240pa	17715pa
			17795pa
0000 0100	Bahrain, Radio Bahrain	6010me	
0000 0100	Canada, CFRX Toronto ON	6070na	
0000 0100	Canada, CFVP Calgary AB	6030na	
0000 0100	Canada, CKZN St Johns NF	6160na	
0000 0100	Canada, CKZU Vancouver BC	6160na	
0000 0100	Canada, Radio Canada International	11700as	
0000 0100	China, China Radio International	6020eu	
	6075as	6180as	7350eu
	9570na	11790as	11885as
			13750as
			15125as
0000 0100	Malaysia, RTM Kajang/Traxx FM	7295do	
0000 0100	Micronesia, The Cross Radio/Pohnpei	4755 as	
0000 0100	New Zealand, Radio NZ International	15720pa	
0000 0100	New Zealand, Radio NZ International	17675pa	
0000 0100	Palau, T8WH/ WHRI	15700as	
0000 0100	Russia, Voice of Russia	9665na	9800na
0000 0100	Spain, Radio Exterior de Espana	6055na	
0000 0100	Thailand, Radio Thailand World Service	15275na	
0000 0100	UK, BBC World Service	5970as	6195as
	9740as	12095as	15335as
			15360as
			17685as
0000 0100	USA, American Forces Network/AFRTS	4319usb	
	5446usb	5765usb	7812usb
	12759usb	13362usb	
0000 0100	USA, EWTN/WEWN Irondale, AL	11520af	
0000 0100	USA, FBN/WTJC Newport NC	9370na	
0000 0100	USA, WBCQ Monticello ME	5110usb	7415usb
	9330usb		
0000 0100	USA, WHRI Cypress Creek SC	5920na	
	7315na	9860na	
0000 0100	USA, WRMI Miami FL	9955ca	
0000 0100	USA, WWRB Nashville TN	3215eu	4840na
	5935af	7465eu	
0000 0100	USA, WWRB Manchester TN	2390na	3185na
	3215na	5050na	
0000 0100	USA, WYFR/Family Radio Worldwide	5950na	
	6985na	7360sa	7520sa
			9505na
			15440ca
0000 0100	Zambia, CVC Radio Christian Voice	4965af	
0030 0045	Albania, Radio Tirana	9860na	
0030 0100	Australia, Radio Australia	15415as	17750as
0030 0100	Canada, Bible Voice Broadcasting	7405as	
0030 0100	Serbia, International Radio Serbia	9685na	
0030 0100	Thailand, Radio Thailand World Service	15275na	
0030 0100	USA, BBG/Voice of America	7430as	7555as
0030 0100	USA, BBG/Voice of America/Special English		
	7430va	9715va	9780va
	12005va	15205va	15290va
			17820va
			9955ca
0030 0100	USA, WRMI/Radio Slovakia Intl		
0035 0045	India, All India Radio/Aizawl	5050do	
0035 0045	India, All India Radio/Chennai	4920do	
0035 0045	India, All India Radio/Guwahati	4940do	
0035 0045	India, All India Radio/Hyderabad	4800do	
0035 0045	India, All India Radio/Imphal	4775do	
0035 0045	India, All India Radio/Port Blair	4760do	
0035 0045	India, All India Radio/Shillong	4970do	
0035 0045	India, All India Radio/Shimla	4965do	
0035 0045	India, All India Radio/Thiruvananthapuram	5010do	

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100 0130	Vietnam, Voice of Vietnam/Overseas Service		
	6175na		
0100 0157	North Korea, Voice of Korea	7220as	9345as
	9730as	11735ca	15180sa
0100 0200	Anguilla, University Network	6090na	
0100 0200	Australia, ABC NT Alice Springs	4835do	
0100 0200	Australia, ABC NT Katherine	5025do	
0100 0200	Australia, ABC NT Tennant Creek	4910do	

0100 0200	Australia, Radio Australia	9660pa	12080pa
	13690pa	15240pa	15415as
	17750as	17795pa	17715pa
0100 0200	Bahrain, Radio Bahrain	6010me	
0100 0200	Canada, CFRX Toronto ON	6070na	
0100 0200	Canada, CFVP Calgary AB	6030na	
0100 0200	Canada, CKZN St Johns NF	6160na	
0100 0200	Canada, CKZU Vancouver BC	6160na	
0100 0200	China, China Radio International	6020eu	
	6175eu	6180as	9410eu
	9535as	9570na	9580na
	9790na	11870as	15215as
			15785as
0100 0200	Cuba, Radio Havana Cuba	6000na	6050na
0100 0200	Malaysia, RTM Kajang/Traxx FM	7295do	
0100 0200	Micronesia, The Cross Radio/Pohnpei	4755 as	
0100 0200	Mongolia, Mongolian Radio 2/Ulaanbaatar		
	7260do		
0100 0200	New Zealand, Radio NZ International	15720pa	
0100 0200	New Zealand, Radio NZ International	17675pa	
0100 0200	Palau, T8WH/ WHRI	15700as	
0100 0200	Russia, Voice of Russia	9665na	9800na
0100 0200	Taiwan, Radio Taiwan International	11875as	
0100 0200	UK, BBC World Service	7395as	9410as
	9740as	11750as	11955as
	15310as	15335as	15360as
			17685as
0100 0200	USA, American Forces Network/AFRTS	4319usb	
	5446usb	5765usb	7812usb
	12759usb	13362usb	
0100 0200	USA, BBG/Voice of America	7430va	9780va
	11705va		
0100 0200	USA, EWTN/WEWN Irondale, AL	11520af	
0100 0200	USA, FBN/WTJC Newport NC	9370na	
0100 0200	USA, KJES Vado NM	7555na	
0100 0200	USA, WBCQ Monticello ME	5110usb	7415usb
	9330usb		
0100 0200	USA, WHRI Cypress Creek SC	9840na	
	9860na		
0100 0200	USA, WHRI Cypress Creek SC	5920na	
0100 0200	USA, WHRI Cypress Creek SC	7315na	
0100 0200	USA, WRMI Miami FL	9955ca	
0100 0200	USA, WWRB Nashville TN	3215eu	4840na
	5935af		
0100 0200	USA, WWRB Manchester TN	2390va	3185na
	5050na		
0100 0200	USA, WYFR/Family Radio Worldwide	6985na	
	9505na	15440ca	
0100 0200	Zambia, CVC Radio Christian Voice	4965af	
0120 0200	Sri Lanka, SLBC	6005as	9770as
0130 0200	USA, BBG/Voice of America/Special English		
	7465va	9820va	
0145 0200	Albania, Radio Tirana	7425na	

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200 0215	Croatia, Croatian Radio	3985eu	7375am
0200 0230	Thailand, Radio Thailand World Service	15275na	
0200 0230	USA, KJES Vado NM	7555na	
0200 0245	USA, WYFR/Family Radio Worldwide	5985ca	
	11835ca		
0200 0257	North Korea, Voice of Korea	13650as	15100as
0200 0300	Anguilla, University Network	6090na	
0200 0300	Argentina, RAE	11710am	
0200 0300	Australia, ABC NT Alice Springs	4835do	
0200 0300	Australia, ABC NT Katherine	5025do	
0200 0300	Australia, ABC NT Tennant Creek	4910do	
0200 0300	Australia, Radio Australia	9660pa	12080pa
	13690pa	15240as	15415as
	17750as	21725pa	15515pa
0200 0300	Bahrain, Radio Bahrain	6010me	
0200 0300	Bulgaria, Radio Bulgaria	9700na	11700na
0200 0300	Canada, CFRX Toronto ON	6070na	
0200 0300	Canada, CFVP Calgary AB	6030na	
0200 0300	Canada, CKZN St Johns NF	6160na	
0200 0300	Canada, CKZU Vancouver BC	6160na	
0200 0300	China, China Radio International	11770as	
	13640as		
0200 0300	Cuba, Radio Havana Cuba	6000na	6050na
0200 0300	Egypt, Radio Cairo	9315na	
0200 0300	Indonesia, Voice of Indonesia	9526va	
0200 0300	Malaysia, RTM Kajang/Traxx FM	7295do	
0200 0300	Micronesia, The Cross Radio/Pohnpei	4755 as	
0200 0300	New Zealand, Radio NZ International	15720pa	
0200 0300	New Zealand, Radio NZ International	17675pa	
0200 0300	Palau, T8WH/ WHRI	17800as	
0200 0300	Philippines, PBS/ Radyo Pilipinas	11880me	
	15285me	17700me	

0200	0300	Russia, Voice of Russia	7440na	9665sa	0300	0400	Bahrain, Radio Bahrain	6010me	
		15425na			0300	0400	Canada, CBC Northern Quebec Service	9625na	
0200	0300	South Korea, KBS World Radio		9580sa					
0200	0300	Sri Lanka, SLBC	6005as	9770as	0300	0400	Canada, CFRX Toronto ON	6070na	
0200	0300	Taiwan, Radio Taiwan International		5950na	0300	0400	Canada, CFVP Calgary AB	6030na	
		9680ca			0300	0400	Canada, CKZN St Johns NF	6160na	
0200	0300	UK, BBC World Service	6005af	6195as	0300	0400	Canada, CKZU Vancouver BC	6160na	
		12095as	15310as	17790as	0300	0400	China, China Radio International	9690am	
0200	0300	USA, American Forces Network/AFRTS		4319usb			9790na	11770as	13750as
		5446usb	5765usb	7812usb			15120as	15785as	
		12759usb	13362usb		0300	0400	Cuba, Radio Havana Cuba	6000na	6050na
0200	0300	USA, EWTN/WEWN Irondale, AL		11520af	0300	0400	Germany, Deutsche Welle	15595as	
0200	0300	USA, FBN/WTJC Newport NC		9370na	0300	0400	Malaysia, RTM Kajang/Traxx FM	7295do	
0200	0300	USA, WBCQ Monticello ME	5110usb	7415usb	0300	0400	Micronesia, The Cross Radio/Pohnpei	4755 as	
		9330usb			0300	0400	New Zealand, Radio NZ International	15720pa	
0200	0300	USA, WHRI Cypress Creek SC		5920na	0300	0400	New Zealand, Radio NZ International	17675pa	
		9840na	9860na		0300	0400	Oman, Radio Sultanate of Oman	15355af	
0200	0300	USA, WRMI Miami FL	9955ca		0300	0400	Palau, T8WH/ WHRI	17800as	
0200	0300	USA, WRNO New Orleans LA		7505am	0300	0400	Russia, Voice of Russia	15735as	
0200	0300	USA, WWCR Nashville TN	3215eu	4840na	0300	0400	Russia, Voice of Russia	9665sa	15425na
		5890af	5935af				15585as		
0200	0300	USA, WWRB Manchester TN	2390va	3185na	0300	0400	South Africa, Channel Africa	3345af	
		5050na			0300	0400	Sri Lanka, SLBC	6005as	9770as
0200	0300	USA, WYFR/Family Radio Worldwide		6100sa	0300	0400	Taiwan, Radio Taiwan International	5950na	
		6985na	9385ca	9505na			15320as		
0200	0300	Zambia, CVC Radio Christian Voice		4965af	0300	0400	UK, BBC World Service	3255af	6005af
0215	0300	Nepal, Radio Nepal	5005as				6145af	6190af	6195as
0230	0255	China, Voice of the Strait (News Channel) Fuzhou		9505do			9410eu	9750af	12035af
		9505do					15310as	15365as	17790as
0230	0300	Albania, Radio Tirana	7425na		0300	0400	USA, American Forces Network/AFRTS		4319usb
0230	0300	Myanmar, Myanma Radio/National Svc	5915do	5920al			5446usb	5765usb	7812usb
		5920al			0300	0400	12759usb	13362usb	
0230	0300	Vietnam, Voice of Vietnam/Overseas Service		6175na	0300	0400	USA, BBG/Voice of America	4930af	6080af
		6175na					9885af	15580af	
0245	0300	Australia, HCJB Global Australia		15400as	0300	0400	USA, EWTN/WEWN Irondale, AL		11520af
0245	0300	India, All India Radio/Bhopal	7430do		0300	0400	USA, FBN/WTJC Newport NC		9370na
0245	0300	India, All India Radio/Delhi	4860do	6030do	0300	0400	USA, WBCQ Monticello ME	7415usb	9330usb
		7235do	11830do	15135do	0300	0400	USA, WHRI Cypress Creek SC		5920na
0245	0300	India, All India Radio/Gorakhpur		3945do			7385na	9840na	
		6030do	7235do	11830do	0300	0400	USA, WRMI Miami FL		9955ca
		deo		15135	0300	0400	USA, WWCR Nashville TN	3215eu	4840na
0245	0300	India, All India Radio/Guwahati		4940do			5890af	5935af	
0245	0300	India, All India Radio/Hyderabad		7420do	0300	0400	USA, WWRB Manchester TN	2390na	3185na
0245	0300	India, All India Radio/Imphal	7335do				5050na		
0245	0300	India, All India Radio/Itanagar		4990do	0300	0400	USA, WYFR/Family Radio Worldwide		11740ca
0245	0300	India, All India Radio/Jaipur	4910do				15255sa		
0245	0300	India, All India Radio/Jeyapore	5040do		0300	0400	Zambia, CVC Radio Christian Voice		4965af
0245	0300	India, All India Radio/Kolkata	7210do		0300	0400	Zambia, ZNBC/Radio Two	6165do	
0245	0300	India, All India Radio/Kurseong		4895do	0315	0400	Australia, Radio Australia	15240pa	
0245	0300	India, All India Radio/Lucknow		4880do	0330	0400	Albania, Radio Tirana	7425na	
0245	0300	India, All India Radio/Radio Kashmir		4760do	0330	0400	Iran, IRIB/ VOIRI	9605na	11920na
0245	0300	India, All India Radio/Shillong		4970do	0330	0400	Vietnam, Voice of Vietnam/Overseas Service		6175na
0245	0300	India, All India Radio/Shimla	6020do				India, All India Radio/Aizawl	5050do	
0245	0300	India, All India Radio/Thiruvananthapuram		7290do	0335	0345	India, All India Radio/Delhi	7235do	11830do
		7290do					15135do		
0245	0300	Zambia, ZNBC/Radio Two	6165do		0335	0345	India, All India Radio/Kolkata	7210do	
0250	0300	Vatican City State, Vatican Radio		6040am					
		7305am	9610am						
0255	0300	Swaziland, TWR Africa		3200af					

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0315	India, All India Radio/Imphal	7335do	
0300	0315	India, All India Radio/Itanagar	4990do	
0300	0315	India, All India Radio/Shillong	4970do	
0300	0325	Swaziland, TWR Africa	3200af	
0300	0327	Iran, IRIB/ VOIRI	11920na	
0300	0330	Egypt, Radio Cairo	9315na	
0300	0330	Myanmar, Myanma Radio/National Svc	9731do	
0300	0330	Philippines, PBS/ Radyo Pilipinas	11880me	
		15285me	17700me	
0300	0330	Vatican City State, Vatican Radio	7305af	
		7360af	9660af	
0300	0355	South Africa, Channel Africa	5980af	
0300	0355	Turkey, Voice of Turkey	6165as	9515va
0300	0357	North Korea, Voice of Korea	7220as	9345as
		9730as		
0300	0357	Romania, Radio Romania International	7335na	
		9645na	11895as	15340as
0300	0358	Germany, Deutsche Welle	12005as	15595as
0300	0400	Anguilla, University Network	6090na	
0300	0400	Australia, ABC NT Alice Springs		4835do
0300	0400	Australia, ABC NT Katherine	5025do	
0300	0400	Australia, ABC NT Tennant Creek		4910do
0300	0400	Australia, Radio Australia	9660pa	12080pa
		13690pa	15240as	15415as
		17750as	21725pa	15515pa

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0427	Iran, IRIB/ VOIRI	9605na	11920na	
0400	0430	USA, BBG/Voice of America	4930af	4960af	
		6080af	9855af	11670af	15580af
0400	0445	USA, WYFR/Family Radio Worldwide		6985na	
		9505na			
0400	0457	Germany, Deutsche Welle	7240af		
0400	0458	New Zealand, Radio NZ International		15720pa	
0400	0458	New Zealand, Radio NZ International		17675pa	
0400	0459	Germany, Deutsche Welle	13840af		
0400	0500	Anguilla, University Network	6090na		
0400	0500	Australia, ABC NT Alice Springs		4835do	
0400	0500	Australia, ABC NT Katherine	5025do		
0400	0500	Australia, ABC NT Tennant Creek		4910do	
0400	0500	Australia, Radio Australia	9660pa	12080pa	
		13690pa	15240as	15515pa	17750pa
		21725pa			
0400	0500	Bahrain, Radio Bahrain	6010me		
0400	0500	Canada, CBC Northern Quebec Service	9625na		
0400	0500	Canada, CFRX Toronto ON	6070na		
0400	0500	Canada, CKZN St Johns NF	6160na		
0400	0500	Canada, CKZU Vancouver BC		6160na	
0400	0500	China, China Radio International		6020na	
		6080na	13750as	15120as	15785as
		17730va	17855va		
0400	0500	France, Radio France Internationale		9805af	
		11995af			

0400	0500	Germany, Deutsche Welle	6180af	15400af
0400	0500	Malaysia, RTM Kajang/Traxx FM	7295do	
0400	0500	Micronesia, The Cross Radio/Pohnpei	4755 as	
0400	0500	Palau, T8WH/ WHRI	17800as	
0400	0500	Russia, Voice of Russia	15735as	
0400	0500	Russia, Voice of Russia	13775na	15735as
0400	0500	South Africa, Channel Africa	3345af	
0400	0500	Sri Lanka, SLBC	6005as	15745as
0400	0500	UK, BBC World Service	3255af	3955eu
0400	0500		6005af	6190af
			11945af	12035af
			15310as	12095as
			15365as	17790as
0400	0500	USA, American Forces Network/AFRTS	4319usb	
			5446usb	5765usb
			12759usb	7812usb
			13362usb	12133usb
0400	0500	USA, EWTN/WEWN Irondale, AL	11520af	
0400	0500	USA, FBN/WTJC Newport NC	9370na	
0400	0500	USA, WHRI Cypress Creek SC	5920na	
			7385na	9825na
0400	0500	USA, WRMI Miami FL	9955ca	
0400	0500	USA, WWCN Nashville TN	3215eu	4840na
			5890af	5935af
0400	0500	USA, WWRB Manchester TN	3185na	
0400	0500	USA, WYFR/Family Radio Worldwide	5985na	
			9680na	9715ca
0400	0500	Zambia, CVC Radio Christian Voice	4965af	
0400	0500	Zambia, ZNBC/Radio Two	6165do	
0430	0500	Swaziland, TWR Africa	3200af	4775af
0430	0500	USA, BBG/Voice of America	4930af	4960af
			6080af	11670af
0435	0445	India, All India Radio/Delhi	4860do	
0455	0500	Nigeria, Voice of Nigeria	15120af	
0459	0500	New Zealand, Radio NZ International	11725pa	
0459	0500	New Zealand, Radio NZ International	11675pa	

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0507	twhf	Canada, CBC Northern Quebec Service	
			9625na	
0500	0530		Germany, Deutsche Welle	6180af 7430af
			9480af	
0500	0530		Japan, Radio Japan NHK World	5975va
			6110na	11970va
0500	0530		UK, BBC World Service	5975eu
0500	0530		Vatican City State, Vatican Radio	5965va
			7250eu	9660af
				11625af
0500	0557		China, China Radio International	6020na
			6190na	11710af
				11895as
				15465as
				17505va
				17540as
				17730va
				17855va
0500	0600		Anguilla, University Network	6090na
0500	0600		Australia, ABC NT Alice Springs	4835do
0500	0600		Australia, ABC NT Katherine	5025do
0500	0600		Australia, ABC NT Tennant Creek	4910do
0500	0600		Australia, Radio Australia	9660pa
				13630pa
				13690pa
				15160pa
				15240pa
				17750as
0500	0600		Bahrain, Radio Bahrain	6010me
0500	0600		Bhutan, Bhutan Broadcasting Service	6035do
0500	0600		Canada, CFRX Toronto ON	6070na
0500	0600		Canada, CKZN St Johns NF	6160na
0500	0600		Canada, CKZU Vancouver BC	6160na
0500	0600		Cuba, Radio Havana Cuba	6000na
				6050na
				6060na
				6150sa
0500	0600	mtwhf	Equatorial Guinea, Radio Africa 2	15190af
0500	0600	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
0500	0600	mtwhf	France, Radio France Internationale	11995af
				13680af
0500	0600		Malaysia, RTM Kajang/Traxx FM	7295do
0500	0600		Micronesia, The Cross Radio/Pohnpei	4755 as
0500	0600		New Zealand, Radio NZ International	11725pa
0500	0600	DRM	New Zealand, Radio NZ International	11675pa
0500	0600		Nigeria, Voice of Nigeria	15120af
0500	0600		Palau, T8WH/ WHRI	17800as
0500	0600		Russia, Voice of Russia	13775na
0500	0600	mtwhf	South Africa, Channel Africa	7230af
0500	0600	mtwhf	Swaziland, TWR Africa	3200af
0500	0600		Swaziland, TWR Africa	9500af
0500	0600	Sat/Sun	Swaziland, TWR Africa	4775af
0500	0600		Taiwan, Radio Taiwan International	6875na
0500	0600		UK, BBC World Service	3255af
				3955eu
				6005af
				6190af
				11945af
				12095as
				15310as
				15420af
				17640as
				17790as
0500	0600		USA, American Forces Network/AFRTS	4319usb
				5446usb
				5765usb
				7812usb
				12133usb
				12759usb
				13362usb

0500	0600	USA, BBG/Voice of America	4930af	6080af
			15580af	
0500	0600	USA, EWTN/WEWN Irondale, AL	11520af	
0500	0600	USA, FBN/WTJC Newport NC	9370na	
0500	0600	USA, WHRI Cypress Creek SC	7385va	
			9825va	11565va
0500	0600	USA, WRMI Miami FL	9955ca	
0500	0600	USA, WTWW Lebanon TN	5755va	12100al
0500	0600	USA, WWCN Nashville TN	3215eu	4840na
			5890af	5935af
0500	0600	USA, WWRB Manchester TN	3185na	
0500	0600	USA, WYFR/Family Radio Worldwide	5985na	
			9680na	
0500	0600	Zambia, CVC Radio Christian Voice	4965af	
0500	0600	Zambia, ZNBC/Radio Two	6165do	
0515	0530	Sat	Greece, Voice of Greece	11645eu
0530	0550	Sun	Greece, Voice of Greece	11645eu
0530	0557	DRM	Romania, Radio Romania International	7305eu
0530	0557		Romania, Radio Romania International	9655eu
				17760eu
				21500eu
0530	0600	Sat/Sun	Clandestine, Sudan Radio Service/SRS	13720af
0530	0600		Thailand, Radio Thailand World Service	17655va

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0615	Sat/Sun	South Africa, TWR Africa	11640af
0600	0630		Germany, Deutsche Welle	9545af
0600	0645	smtwhf	South Africa, TWR Africa	11640af
0600	0655	mtwhf	South Africa, Channel Africa	15255af
0600	0658		New Zealand, Radio NZ International	11725pa
0600	0658	DRM	New Zealand, Radio NZ International	11675pa
0600	0700		Anguilla, University Network	6090na
0600	0700		Australia, ABC NT Alice Springs	4835do
0600	0700		Australia, ABC NT Katherine	5025do
0600	0700		Australia, ABC NT Tennant Creek	4910do
0600	0700		Australia, Radio Australia	9660pa
				13630pa
				13690pa
				15160pa
				15240pa
				15415as
				17750as
0600	0700		Bahrain, Radio Bahrain	6010me
0600	0700		Canada, CFRX Toronto ON	6070na
0600	0700		Canada, CFVP Calgary AB	6030na
0600	0700		Canada, CKZN St Johns NF	6160na
0600	0700		Canada, CKZU Vancouver BC	6160na
0600	0700		China, China Radio International	11710af
				11870me
				11895as
				13660as
				15350as
				15465as
				17505va
				17540as
				17710as
0600	0700		Cuba, Radio Havana Cuba	6000na
				6050na
				6060na
				6150sa
0600	0700	mtwhf	Equatorial Guinea, Radio Africa 2	15190af
0600	0700	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
0600	0700	mtwhf	France, Radio France Internationale	11615va
				15160af
				17800af
0600	0700		Malaysia, RTM Kajang/Traxx FM	7295do
0600	0700		Malaysia, RTM/Voice of Malaysia	6175as
				9750as
				15295as
0600	0700		Micronesia, The Cross Radio/Pohnpei	4755 as
0600	0700		Nigeria, Voice of Nigeria	15120af
0600	0700		Palau, T8WH/ WHRI	17800as
0600	0700		Papua New Guinea, Radio Fly	5960do
0600	0700		Russia, Voice of Russia	15405pa
0600	0700	mtwhf	South Africa, Channel Africa	7230af
0600	0700		South Africa, CVC 1 Africa Radio	13590af
0600	0700		Swaziland, TWR Africa	9500af
0600	0700		UK, BBC World Service	5875eu
				6005af
				6190af
				7430eu
				9410af
				12015af
				12095as
				15105af
				15310as
				15420af
				17640af
				17790as
0600	0700		USA, American Forces Network/AFRTS	4319usb
				5446usb
				5765usb
				7812usb
				12133usb
0600	0700		USA, BBG/Voice of America	6080af
				15580af
0600	0700		USA, EWTN/WEWN Irondale, AL	11520af
0600	0700		USA, FBN/WTJC Newport NC	9370na
0600	0700		USA, WHRI Cypress Creek SC	7385va
				9825va
				11565va
0600	0700		USA, WRMI Miami FL	9955ca
0600	0700		USA, WTWW Lebanon TN	5755va
0600	0700		USA, WWCN Nashville TN	3215eu
				4840na
				5890af
				5935af
0600	0700		USA, WWRB Manchester TN	3185na
0600	0700		USA, WYFR/Family Radio Worldwide	5850ca
				7520eu
				9680na
				11530af
				11580eu
				13590af
0600	0700		Zambia, CVC Radio Christian Voice	4965af
0600	0700		Zambia, ZNBC/Radio Two	6165do
0602	0700		Swaziland, TWR Africa	6120af

0630	0645		India, All India Radio/Guwahati	7280do
0630	0645		India, All India Radio/Hyderabad	7420do
0630	0645		India, All India Radio/Kurseong	7230do
0630	0645		India, All India Radio/Mumbai	7240do
0630	0645		India, All India Radio/Thiruvananthapuram	7290do
0630	0700		Bulgaria, Radio Bulgaria	9600na 11600na
0630	0700		Vatican City State, Vatican Radio	11625af
			13765af 15570af	
0645	0700	Sun	Germany, TWR Europe	6105eu
0645	0700	Sun	Monaco, TWR Europe	9800eu
0659	0700		New Zealand, Radio NZ International	6170pa
0659	0700	DRM	New Zealand, Radio NZ International	7440pa

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0730	Sun	Canada, Bible Voice Broadcasting	5945eu
0700	0730		China, Xizang PBS/Lhasa	4905do 4920do
			6025do 6110do 6130do	9490do
			9580do	
0700	0745	Sat	Canada, Bible Voice Broadcasting	5945eu
0700	0745		USA, WYFR/Family Radio Worldwide	7570eu
0700	0750	mtwhf	Germany, TWR Europe	6105eu
0700	0750	smtwhf	Monaco, TWR Europe	9800eu
0700	0758		New Zealand, Radio NZ International	6170pa
0700	0758	DRM	New Zealand, Radio NZ International	7440pa
0700	0800		Anguilla, University Network	6090na
0700	0800		Australia, ABC NT Alice Springs	4835do
0700	0800		Australia, ABC NT Katherine	5025do
0700	0800		Australia, ABC NT Tennant Creek	4910do
0700	0800		Australia, Radio Australia	9475as 9660pa
			9710pa 11945as 12080pa	13630pa
			15160pa	
0700	0800		Bahrain, Radio Bahrain	6010me
0700	0800	m/DRM	Belgium, TDP Radio	6015eu
0700	0800		Canada, CFRX Toronto ON	6070na
0700	0800		Canada, CFVP Calgary AB	6030na
0700	0800		Canada, CKZN St Johns NF	6160na
0700	0800		Canada, CKZU Vancouver BC	6160na
0700	0800		China, China Radio International	11895as
			13660as 15125va 13710eu	15350as
			15465as 17490eu 17540as	17710as
0700	0800	mtwhf	Equatorial Guinea, Radio Africa 2	15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
0700	0800	mtwhf	France, Radio France Internationale	15615af
			17605af	
0700	0800		Malaysia, RTM Kajang/Traxx FM	7295do
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as
			9750as 15295as	
0700	0800		Micronesia, The Cross Radio/Pohnpei	4755 as
0700	0800		Palau, T8WH/ WHRI	17800as
0700	0800		Papua New Guinea, Radio Fly	5960do
0700	0800		Russia, Voice of Russia	15405pa
0700	0800	mtwhf	South Africa, Channel Africa	7230af
0700	0800		South Africa, CVC 1 Africa Radio	13590af
0700	0800		Swaziland, TWR Africa	6120af 9500af
0700	0800		UK, BBC World Service	5875eu 6190af
			11760me 11765af 11830af	12095af
			15310as 15400af 15575as	17640af
			17790as 17830af	
0700	0800		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
0700	0800		USA, EWTN/WEWN Irondale, AL	11520af
0700	0800		USA, FBN/WTJC Newport NC	9370na
0700	0800		USA, WHRI Cypress Creek SC	7385va
			9825va 11565va	
0700	0800		USA, WRMI Miami FL	9955ca
0700	0800		USA, WTWW Lebanon TN	5755va 12100af
0700	0800		USA, WWCN Nashville TN	3215eu 4840na
			5890af 5935af	
0700	0800		USA, WWRB Manchester TN	3185na
0700	0800		USA, WYFR/Family Radio Worldwide	5950ca
			5985na 6875na 9385af	9505ca
0700	0800		Zambia, CVC Radio Christian Voice	13590af
0700	0800		Zambia, ZNBC/Radio Two	6165do
0715	0750	Sun	Germany, TWR Europe	6105eu
0715	0750	Sat	Monaco, TWR Europe	9800eu
0730	0745		India, All India Radio/Aizawl	5050do
0730	0745		India, All India Radio/Delhi	6190do 11710do
			15185do 15260do	
0730	0745		India, All India Radio/Guwahati	7280do
0730	0745		India, All India Radio/Imphal	7335do
0730	0745		India, All India Radio/Jaipur	7325do
0730	0745		India, All India Radio/Kolkata	7210do
0730	0745		India, All India Radio/Kurseong	7230do
0730	0745		India, All India Radio/Shimla	6020do

0730	0800		Australia, HCJB Global Australia	11750pa
0730	0800		India, All India Radio/Chennai	4920do
0759	0800		New Zealand, Radio NZ International	6170pa
0759	0800	DRM	New Zealand, Radio NZ International	7440pa

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0830		Australia, ABC NT Alice Springs	4835do
0800	0830		Australia, ABC NT Katherine	5025do
0800	0830		Australia, ABC NT Tennant Creek	4910do
0800	0830		Australia, HCJB Global Australia	11750pa
0800	0845		USA, WYFR/Family Radio Worldwide	5950ca
			9385af	
0800	0900		Anguilla, University Network	6090na
0800	0900		Australia, Radio Australia	5995pa 9475as
			9590pa 9710pa 9580pa	11945as
			12080pa 13630pa	
0800	0900		Bahrain, Radio Bahrain	6010me
0800	0900	t/DRM	Belgium, TDP Radio	6015eu
0800	0900		Bhutan, Bhutan Broadcasting Service	6035do
0800	0900		Canada, CFRX Toronto ON	6070na
0800	0900		Canada, CFVP Calgary AB	6030na
0800	0900		Canada, CKZN St Johns NF	6160na
0800	0900		Canada, CKZU Vancouver BC	6160na
0800	0900		China, China Radio International	11620as
			11895as 13710eu 15350as	15465as
			15625va 17490eu 17540as	
0800	0900	mtwhf	Equatorial Guinea, Radio Africa 2	15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
0800	0900	Sat	Italy, IRRS-Shortwave	9510va
0800	0900		Italy, IRRS-Shortwave/European Gospel Radio	7290va
0800	0900		Malaysia, RTM Kajang/Traxx FM	7295do
0800	0900		Malaysia, RTM/Voice of Malaysia	6175as
			9750as 15295as	
0800	0900		Micronesia, The Cross Radio/Pohnpei	4755 as
0800	0900		New Zealand, Radio NZ International	6170pa
0800	0900	DRM	New Zealand, Radio NZ International	7440pa
0800	0900		Palau, T8WH/ WHRI	17800as
0800	0900		Papua New Guinea, Radio Fly	5960do
0800	0900		Russia, Voice of Russia	15405pa
0800	0900	mtwhf	South Africa, Channel Africa	9625af
0800	0900		South Africa, CVC 1 Africa Radio	13590af
0800	0900	Sun	South Africa, SA Radio League	7205af
			17570af	
0800	0900		South Korea, KBS World Radio	9570as
0800	0900		UK, BBC World Service	6190af 11760me
			12095af 15310as 15400af	15575as
			17640af 17790as 17830af	21470af
0800	0900		USA, American Forces Network/AFRTS	4319usb
			5446usb 5765usb 7812usb	12133usb
			12759usb 13362usb	
0800	0900		USA, EWTN/WEWN Irondale, AL	11520af
0800	0900		USA, FBN/WTJC Newport NC	9370na
0800	0900		USA, WHRI Cypress Creek SC	7385va
			11565va	
0800	0900		USA, WRMI Miami FL	9955ca
0800	0900		USA, WTWW Lebanon TN	5755va
0800	0900		USA, WWCN Nashville TN	3215eu 4840na
			5890af 5935af	
0800	0900		USA, WWRB Manchester TN	3185na
0800	0900		USA, WYFR/Family Radio Worldwide	5985na
			6875na	
0800	0900		Zambia, CVC Radio Christian Voice	13590af
0800	0900		Zambia, ZNBC/Radio Two	6165do
0815	0900		Nepal, Radio Nepal	5005as
0820	0900	mtwhfa	Guam, TWR Asia/KTWR	15170as
0830	0845		India, All India Radio/Aizawl	5050do
0830	0845		India, All India Radio/Chennai	4920do
0830	0845		India, All India Radio/Delhi	6190do 11710do
			15185do 15260do	
0830	0845		India, All India Radio/Hyderabad	7420do
0830	0845		India, All India Radio/Imphal	7335do
0830	0845		India, All India Radio/Itanagar	4990do
0830	0845		India, All India Radio/Kolkata	7210do
0830	0845		India, All India Radio/Shillong	7315do
0830	0845		India, All India Radio/Thiruvananthapuram	7290do
0830	0900		Australia, ABC NT Alice Springs	2310do
0830	0900		Australia, ABC NT Katherine	2485do
0830	0900		Australia, ABC NT Tennant Creek	2325do
0830	0900		Guam, TWR Asia/KTWR	11840as

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	0910		Guam, TWR Asia/KTWR	11840as
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0900	0959		Germany, Deutsche Welle	15640as	17820as
0900	1000		Anguilla, University Network	6090na	
0900	1000		Australia, ABC NT Alice Springs		2310do
0900	1000		Australia, ABC NT Katherine	2485do	
0900	1000		Australia, ABC NT Tennant Creek		2325do
0900	1000		Australia, Radio Australia	9475as	9580pa
			9590pa	11945as	
0900	1000		Bahrain, Radio Bahrain	6010me	
0900	1000	w/DRM	Belgium, TDP Radio	6015eu	
0900	1000		Canada, CFRX Toronto ON	6070na	
0900	1000		Canada, CFVP Calgary AB	6030na	
0900	1000		Canada, CKZN St Johns NF	6160na	
0900	1000		Canada, CKZU Vancouver BC		6160na
0900	1000		China, China Radio International		11620as
			13790pa	15210as	15270eu
			17490eu	17570eu	17750as
0900	1000	Sun	Greece, Voice of Greece	9420va	15630va
0900	1000		Italy, IRRS-Shortwave/European Gospel Radio		7290va
0900	1000		Malaysia, RTM Kajang/Traxx FM		7295do
0900	1000		Malaysia, RTM/Voice of Malaysia		6175as
			9750as	15295as	
0900	1000		Micronesia, The Cross Radio/Pohnpei		4755 as
0900	1000	DRM	New Zealand, Radio NZ International		7440pa
0900	1000		New Zealand, Radio NZ International		6170pa
0900	1000		Nigeria, Voice of Nigeria	9690af	
0900	1000		Papua New Guinea, Radio Fly		5960do
0900	1000		Russia, Voice of Russia	15170as	
0900	1000	mtwhf	South Africa, Channel Africa	9625af	
0900	1000		South Africa, CVC 1 Africa Radio		13590af
0900	1000		UK, BBC World Service	6190af	6195as
			9740as	11760me	12095af
			15400af	15575as	17640af
			17790as	17830af	21470af
					21630as
0900	1000		USA, American Forces Network/AFRTS		4319usb
			5446usb	5765usb	7812usb
			12759usb	13362usb	
0900	1000		USA, EWTN/WEWN Irondale, AL		11520af
0900	1000		USA, FBN/WTJC Newport NC		9370na
0900	1000		USA, WHRI Cypress Creek SC		7385va
			9825va	11565va	
0900	1000		USA, WRMI Miami FL		9955ca
0900	1000		USA, WTWW Lebanon TN		5755va
0900	1000		USA, WWCR Nashville TN		4840na
			5935af	9985eu	
0900	1000		USA, WWRB Manchester TN		3185na
0900	1000		USA, WYFR/Family Radio Worldwide		9465as
			9755ca		
0900	1000		Zambia, CVC Radio Christian Voice		13590af
0900	1000		Zambia, ZNBC/Radio Two		6165do
0930	1000		China, Voice of the Strait/Fuzhou		6115do
0930	1000	Sun	Italy, IRRS-Shortwave		9510va
0930	1000		Saudi Arabia, BSKSA/External Service		15250af
0959	1000		Netherlands, R Netherlands Worldwide		12065as
			15110as		

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1025		China, Voice of the Strait (News Channel) Fuzhou		9505do
1000	1030		Japan, Radio Japan NHK World		9605as
			9625pa	9840pa	
1000	1030		Vietnam, Voice of Vietnam/Overseas Service		
			9840as	12020as	
1000	1057		Netherlands, R Netherlands Worldwide		12065as
			15110as		
1000	1057		North Korea, Voice of Korea	11710ca	11735as
			13650as	15180sa	
1000	1058	DRM	New Zealand, Radio NZ International		7440pa
1000	1058		New Zealand, Radio NZ International		6170pa
1000	1100		Anguilla, University Network		11775na
1000	1100		Australia, ABC NT Alice Springs		2310do
1000	1100		Australia, ABC NT Katherine	2485do	
1000	1100		Australia, ABC NT Tennant Creek		2325do
1000	1100		Australia, Radio Australia	9475as	9580pa
			9590pa	11945as	
1000	1100		Bahrain, Radio Bahrain	6010me	
1000	1100	h/DRM	Belgium, TDP Radio	6015eu	
1000	1100		Canada, CFRX Toronto ON	6070na	
1000	1100		Canada, CFVP Calgary AB	6030na	
1000	1100		Canada, CKZN St Johns NF	6160na	
1000	1100		Canada, CKZU Vancouver BC		6160na
1000	1100		China, China Radio International		6040na
			11610as	11635as	13590as
			13790na	15190as	15210as
			17490as		15350as

1000	1100		India, All India Radio/External Service		7270as
			13695pa	15260as	15410as
			17800as	17895pa	
1000	1100		Indonesia, Voice of Indonesia		9526va
1000	1100	Sun	Italy, IRRS-Shortwave		9510va
1000	1100		Italy, IRRS-Shortwave/European Gospel Radio		7290va
1000	1100		Malaysia, RTM Kajang/Traxx FM		7295do
1000	1100		Micronesia, The Cross Radio/Pohnpei		4755as
1000	1100		Nigeria, Voice of Nigeria	9690af	
1000	1100		Russia, Voice of Russia	15170as	
1000	1100		Saudi Arabia, BSKSA/External Service		15250af
1000	1100	mtwhf	South Africa, Channel Africa	9625af	
1000	1100		South Africa, CVC 1 Africa Radio		13590af
1000	1100		UK, BBC World Service	6190af	6195as
			9740as	11760me	12095af
			15400af	15575as	17640af
			17790as	17830af	21470af
					21660as
1000	1100	Sat/Sun	UK, BBC World Service		17830af
1000	1100		USA, American Forces Network/AFRTS		4319usb
			5446usb	5765usb	7812usb
			12759usb	13362usb	
1000	1100		USA, EWTN/WEWN Irondale, AL		9390as
1000	1100		USA, FBN/WTJC Newport NC		9370na
1000	1100		USA, KNLS Anchor Point AK		11870as
1000	1100		USA, WHRI Cypress Creek SC		7385va
			11565va		
1000	1100		USA, WRMI Miami FL		9955ca
1000	1100		USA, WTWW Lebanon TN		5755va
1000	1100		USA, WWCR Nashville TN		4840na
			5935af	9985eu	
1000	1100		USA, WWRB Manchester TN		3185na
1000	1100		USA, WYFR/Family Radio Worldwide		5950na
			5985na	6875na	9465as
1000	1100		Zambia, CVC Radio Christian Voice		13590af
1000	1100		Zambia, ZNBC/Radio Two		6165do
1030	1100		Iran, IRIB/ VOIRI	17710as	21630as
1030	1100		Mongolia, Voice of Mongolia		12085as
1059	1100		New Zealand, Radio NZ International		9655pa
1059	1100	DRM	New Zealand, Radio NZ International		7440pa

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1105		Pakistan, PBC/Radio Pakistan	15725eu	17720eu
1100	1120	f/DRM	Japan, Radio Japan NHK World		9760eu
1100	1127		Iran, IRIB/ VOIRI	17710as	21630as
1100	1130	Sat/DRM	South Korea, KBS World Radio		9760eu
1100	1130	fa	UK, BBC World Service		9760eu
1100	1130		Vietnam, Voice of Vietnam/Overseas Service		7285as
1100	1145		USA, WYFR/Family Radio Worldwide		6875na
			9550sa	9755ca	
1100	1157		Romania, Radio Romania International		15210eu
			15430eu	17510af	17670af
1100	1158	DRM	New Zealand, Radio NZ International		7440pa
1100	1200		Anguilla, University Network		11775na
1100	1200		Australia, ABC NT Alice Springs		2310do
1100	1200		Australia, ABC NT Katherine	2485do	
1100	1200		Australia, ABC NT Tennant Creek		2325do
1100	1200		Australia, Radio Australia	5995pa	6020pa
			9475as	9560pa	9580pa
			11945as	12080pa	
1100	1200		Bahrain, Radio Bahrain	6010me	
1100	1200	f/DRM	Belgium, TDP Radio	6015eu	
1100	1200	Sat/Sun	Canada, CBC Northern Quebec Service		9625na
1100	1200		Canada, CFRX Toronto ON	6070na	
1100	1200		Canada, CFVP Calgary AB	6030na	
1100	1200		Canada, CKZN St Johns NF	6160na	
1100	1200		Canada, CKZU Vancouver BC		6160na
1100	1200		China, China Radio International		5955as
			6040as	11650as	11660as
			11795as	13590as	13645as
			13720as	17490eu	
1100	1200	Sun	Italy, IRRS-Shortwave		9510va
1100	1200		Italy, IRRS-Shortwave/European Gospel Radio		7290va
1100	1200		Malaysia, RTM Kajang/Traxx FM		7295do
1100	1200		New Zealand, Radio NZ International		9655pa
1100	1200		Nigeria, Voice of Nigeria	9690af	
1100	1200		Russia, Voice of Russia	12065as	
1100	1200		Saudi Arabia, BSKSA/External Service		15250af
1100	1200	mtwhf	South Africa, Channel Africa	9625af	
1100	1200		South Africa, CVC 1 Africa Radio		13590af
1100	1200		Taiwan, Radio Taiwan International		7445as
			11715as		

1100	1200	UK, BBC World Service	6140as	6195as	
		9740as	11760me	12095af	15285as
		15310as	15400af	15575as	17640as
		17760as	17790as	17830af	21470af
1100	1200	USA, American Forces Network/AFRTS	4319usb		
		5446usb	5765usb	7812usb	12133usb
		12759usb	13362usb		
1100	1200	USA, EWTN/WEWN Irondale, AL	9390as		
1100	1200	USA, FBN/WTJC Newport NC	9370na		
1100	1200	USA, WHRI Cypress Creek SC	7385va		
		9410va	11565va		
1100	1200	USA, WRMI Miami FL	9955ca		
1100	1200	USA, WWCR Nashville TN	4840na	5890af	
		5935af	15825eu		
1100	1200	USA, WWRB Manchester TN	3185na		
1100	1200	USA, WYFR/Family Radio Worldwide	5950na		
		7730sa	9625sa	15560as	
1100	1200	Zambia, CVC Radio Christian Voice	13590af		
1100	1200	Zambia, ZNBC/Radio Two	6165do		
1130	1140 f	Vatican City State, Vatican Radio	15595as		
		17765as			
1130	1200	Vietnam, Voice of Vietnam/Overseas Service			
		9840as	12020as		
1135	1145	India, All India Radio/Aizawl	5050do		
1135	1145	India, All India Radio/Delhi	9595do	11710do	
		15185do			
1135	1145	India, All India Radio/Shillong	4970do		

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1215	Vatican City State, Vatican Radio	13730am		
1200	1230	Germany, AWR Europe	17535as		
1200	1230	Saudi Arabia, BSKSA/External Service	15250af		
1200	1245	USA, WYFR/Family Radio Worldwide	5950na		
		5985na			
1200	1258	New Zealand, Radio NZ International	9655pa		
1200	1259	Poland, Polskie Radio Warsaw	11675eu		
		11980eu			
1200	1300	Anguilla, University Network	11775na		
1200	1300	Australia, ABC NT Alice Springs	2310do		
1200	1300	Australia, ABC NT Katherine	2485do		
1200	1300	Australia, ABC NT Tennant Creek	2325do		
1200	1300	Australia, Radio Australia	5995pa	6020pa	
		9475as	9560pa	9580pa	9590pa
		11945as			
1200	1300	Bahrain, Radio Bahrain	6010me		
1200	1300 Sat/ DRM	Belgium, TDP Radio	6015eu		
1200	1300 Sat/Sun	Canada, CBC Northern Quebec Service			
		9625na			
1200	1300	Canada, CFRX Toronto ON	6070na		
1200	1300	Canada, CFVP Calgary AB	6030na		
1200	1300	Canada, CKZN St Johns NF	6160na		
1200	1300	Canada, CKZU Vancouver BC	6160na		
1200	1300	China, China Radio International	5955as		
		9460as	9600as	9645as	9730as
		9760pa	11650as	11660as	11690va
		11760pa	11980as	13645as	13650as
		13790eu	17490eu		
1200	1300	Ethiopia, Radio Ethiopia/National Program			
		5990do	7110do	9705do	
1200	1300	Italy, IRRS-Shortwave/European Gospel Radio			
		7290va			
1200	1300	Japan, Radio Japan NHK World	6120na		
		9695as			
1200	1300	Malaysia, RTM Kajang/Traxx FM	7295do		
1200	1300	Nigeria, Voice of Nigeria	9690af		
1200	1300 DRM	Russia, Voice of Russia	9445as		
1200	1300	Russia, Voice of Russia	11500as		
1200	1300	South Africa, CVC 1 Africa Radio	13590af		
1200	1300	South Korea, KBS World Radio	9650na		
1200	1300	UK, BBC World Service	5875as	6140as	
		6190af	6195as	9740as	11750as
		11760me	12095af	15310as	15575as
		17640af	17790af	17830af	21470af
1200	1300	USA, American Forces Network/AFRTS	4319usb		
		5446usb	5765usb	7812usb	12133usb
		12759usb	13362usb		
1200	1300	USA, BBG/Voice of America	7575va	9510va	
		12075va	12150va		
1200	1300	USA, EWTN/WEWN Irondale, AL	13580va		
1200	1300	USA, FBN/WTJC Newport NC	9370na		
1200	1300	USA, KNLS Anchor Point AK	11870as		
1200	1300	USA, WHRI Cypress Creek SC	7385va		
		9410va	11565va		
1200	1300	USA, WRMI Miami FL	9955ca		
1200	1300	USA, WWCR Nashville TN	7490af	9980af	
		13845na	15825eu		

1200	1300	USA, WWRB Manchester TN	3185va		
1200	1300	USA, WYFR/Family Radio Worldwide	17555sa		
		17795ca			
1200	1300	Zambia, CVC Radio Christian Voice	13590af		
1200	1300	Zambia, ZNBC/Radio Two	6165do		
1215	1300	Egypt, Radio Cairo	17870as		
1230	1245	India, All India Radio/Aizawl	5050do		
1230	1245	India, All India Radio/Chennai	4920do		
1230	1245	India, All India Radio/Delhi	4860do	6085do	
1230	1245	India, All India Radio/Hyderabad	4800do		
1230	1245	India, All India Radio/Jeyapore	5040do		
1230	1245	India, All India Radio/Kurseong	4895do		
1230	1245	India, All India Radio/Port Blair	4760do		
1230	1245	India, All India Radio/Radio Kashmir	4950do		
1230	1245	India, All India Radio/Shillong	4970do		
1230	1245	India, All India Radio/Thiruvananthapuram	5010do		
1230	1300	Australia, HCJB Global Australia	15400as		
1230	1300	Thailand, Radio Thailand World Service	9890va		
1230	1300	Turkey, Voice of Turkey	15450va		
1230	1300	Vietnam, Voice of Vietnam/Overseas Service			
		9840as	12020as		
1259	1300	New Zealand, Radio NZ International	6170pa		

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1325	Turkey, Voice of Turkey	15450va		
1300	1330	Egypt, Radio Cairo	17870as		
1300	1330	Japan, Radio Japan NHK World	15735as		
		15660al			
1300	1357	North Korea, Voice of Korea	9335na	11710na	
		13760eu	15245eu		
1300	1400	Anguilla, University Network	11775na		
1300	1400	Australia, ABC NT Alice Springs	2310do		
1300	1400	Australia, ABC NT Katherine	2485do		
1300	1400	Australia, Radio Australia	5995pa	6020pa	
		9560pa	9580pa	9590pa	
1300	1400	Bahrain, Radio Bahrain	6010me		
1300	1400 Sun/DRM	Belgium, TDP Radio	6015na		
1300	1400 Sat/Sun	Canada, CBC Northern Quebec Service			
		9625na			
1300	1400	Canada, CFRX Toronto ON	6070na		
1300	1400	Canada, CFVP Calgary AB	6030na		
1300	1400	Canada, CKZN St Johns NF	6160na		
1300	1400	Canada, CKZU Vancouver BC	6160na		
1300	1400	China, China Radio International	5995as		
		9570na	9650na	9730as	9760pa
		9765va	9870as	11660as	11760pa
		11980as	13610eu	13755as	13760eu
		13790eu	15260na		
1300	1400 Sat	Greece, Voice of Greece	15630va		
1300	1400 Sun	Greece, Voice of Greece	9420va		
1300	1400	Indonesia, Voice of Indonesia	9526as		
1300	1400	Italy, IRRS-Shortwave/European Gospel Radio			
		7290va			
1300	1400	Malaysia, RTM Kajang/Traxx FM	7295do		
1300	1400	New Zealand, Radio NZ International	6170pa		
1300	1400	Nigeria, Voice of Nigeria	9690af		
1300	1400	Russia, Voice of Russia	12065as		
1300	1400	South Africa, CVC 1 Africa Radio	13590af		
1300	1400	South Korea, KBS World Radio	9570as		
1300	1400	Tajikistan, Voice of Tajik	7245va		
1300	1400	UK, BBC World Service	5875as	6190af	
		6195as	9740as	11760me	12095af
		15310as	15420af	15575as	17790as
		17830af	21470af		
1300	1400	USA, American Forces Network/AFRTS	4319usb		
		5446usb	5765usb	7812usb	12133usb
		12759usb	13362usb		
1300	1400 Sat/Sun	USA, BBG/Voice of America	9510va	9760va	
		12150va			
1300	1400	USA, EWTN/WEWN Irondale, AL	13580va		
1300	1400	USA, FBN/WTJC Newport NC	9370na		
1300	1400	USA, KJES Vado NM	7555na		
1300	1400	USA, WBCQ Monticello ME	9330usb		
1300	1400	USA, WHRI Cypress Creek SC	7385va		
		11565va			
1300	1400 Sat/Sun	USA, WHRI Cypress Creek SC	9840af		
1300	1400	USA, WRMI Miami FL	9955ca		
1300	1400	USA, WWCR Nashville TN	7490af	9980af	
		13845na	15825eu		
1300	1400	USA, WWRB Manchester TN	9385na		
1300	1400	USA, WYFR/Family Radio Worldwide	11830na		
		11865na	11910na	17795ca	11520as
		11560as	12160as		
1300	1400	Zambia, CVC Radio Christian Voice	13590af		
1300	1400	Zambia, ZNBC/Radio Two	6165do		

1330	1345		India, All India Radio/Delhi	6085do
1330	1400	sth	Guam, AWR/KSDA	11860as
1330	1400		India, All India Radio/External Service	9690as
			11620as	13710as
1330	1400		Vietnam, Voice of Vietnam/Overseas Service	
			9840as	12020as
1345	1400	Sun	Canada, Bible Voice Broadcasting	17945as
1359	1400		Netherlands, R Netherlands Worldwide	11835as

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1430	Sun	Germany, Pan American Broadcasting	15205as
1400	1430		Japan, Radio Japan NHK World	11705as
			15735as	21560va
1400	1430		Thailand, Radio Thailand World Service	9575va
1400	1430	Sun	UK, FEBA Radio	12025as
1400	1457		Netherlands, R Netherlands Worldwide	9800as
			11835as	
1400	1500		Anguilla, University Network	11775na
1400	1500		Australia, ABC NT Alice Springs	2310do
1400	1500		Australia, ABC NT Katherine	2485do
1400	1500		Australia, ABC NT Tennant Creek	2325do
1400	1500		Australia, Radio Australia	5995pa
			7240pa	9590pa
			11660as	6080as
1400	1500		Bahrain, Radio Bahrain	6010me
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu
1400	1500	Sat	Canada, Bible Voice Broadcasting	17945as
1400	1500	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1400	1500		Canada, CFRX Toronto ON	6070na
1400	1500		Canada, CFVP Calgary AB	6030na
1400	1500		Canada, CKZN St Johns NF	6160na
1400	1500		Canada, CKZU Vancouver BC	6160na
1400	1500		China, China Radio International	5955as
			9765va	9870as
			13710eu	11665me
			11765as	11740na
			13790eu	
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa/Malabo	
			15190af	
1400	1500		India, All India Radio/External Service	9690as
			11620as	13710as
1400	1500		Italy, IRRS-Shortwave/European Gospel Radio	
			7290va	
1400	1500		Libya, LJBC Voice of Africa	17725af
1400	1500		Malaysia, RTM Kajang/Traxx FM	7295do
1400	1500		New Zealand, Radio NZ International	6170pa
1400	1500		Nigeria, Voice of Nigeria	9690af
1400	1500		Oman, Radio Sultanate of Oman	15140va
1400	1500	DRM	Russia, Voice of Russia	7225eu
1400	1500		Russia, Voice of Russia	4975va
1400	1500		South Africa, CVC 1 Africa Radio	13590af
1400	1500		UK, BBC World Service	5845as
			6190af	6195as
			7435af	9740as
			12095as	13820as
			17830af	15310as
			17640af	
1400	1500		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb
			7812usb	12133usb
			12759usb	13362usb
1400	1500		USA, BBG/Voice of America	6080af
			15580af	17545af
1400	1500	mtwhf	USA, BBG/Voice of America	7540va
			12150va	7575va
1400	1500		USA, EWTN/WEWN Irondale, AL	15610va
1400	1500		USA, FBN/WTJC Newport NC	9370na
1400	1500		USA, Overcomer Ministries	9655eu
1400	1500		USA, WBCQ Monticello ME	9330usb
1400	1500		USA, WHRI Cypress Creek SC	7385va
			9840va	
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC	9840af
			17510af	
1400	1500		USA, WJHR International Milton FL	15550na
1400	1500		USA, WRMI Miami FL	9955ca
1400	1500		USA, WWCN Nashville TN	7490af
			13845na	15825eu
1400	1500		USA, WWRB Manchester TN	9385na
1400	1500		USA, WYFR/Family Radio Worldwide	9615as
			11560as	11910na
			13695na	17795ca
1400	1500		Zambia, CVC Radio Christian Voice	13590af
1400	1500		Zambia, ZNBC/Radio Two	6165do
1405	1435	Sat/Sun	Canada, Bible Voice Broadcasting	9345as
1415	1430	mtwhfa	Germany, Pan American Broadcasting	15205as
1415	1500	Sun	Canada, Bible Voice Broadcasting	17945af
1415	1500		Nepal, Radio Nepal	5005as
1420	1440		India, All India Radio/Itanagar	4990do
1425	1455		Swaziland, TWR Africa	4760af
1430	1445	Sat	Germany, Pan American Broadcasting	15205as

1430	1445		India, All India Radio/Aizawl	5050do
1430	1445		India, All India Radio/Delhi	6085do
			9835do	9575do
1430	1445		India, All India Radio/Jepore	5040do
1430	1445		India, All India Radio/Mumbai	4840do
1430	1500	mtwhfa	Albania, Radio Tirana	13625na
1430	1500		Guam, AWR/KSDA	9560as
1430	1500	Sat	India, All India Radio/Gangtok	4835do
1445	1500	smtwhf	Australia, HCJB Global Australia	15340as
1450	1500		India, All India Radio/Itanagar	4990do
1450	1500		India, All India Radio/Kurseong	4895do

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1515	Sun	Canada, Bible Voice Broadcasting	12035as
1500	1525	tf	Guam, TWR Asia/KTWR	12140as
1500	1530	Sun	Canada, Bible Voice Broadcasting	17945as
1500	1530		Guam, AWR/KSDA	11720as
1500	1530		India, All India Radio/Jepore	5040do
1500	1530		Vietnam, Voice of Vietnam/Overseas Service	
			7285as	9840as
			12020as	
1500	1535	mwhfa	Guam, TWR Asia/KTWR	12140as
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa
1500	1550		New Zealand, Radio NZ International	6170pa
1500	1557		North Korea, Voice of Korea	9335na
			13760eu	15245eu
1500	1558		Libya, LJBC Voice of Africa	17725af
1500	1600		Anguilla, University Network	11775na
1500	1600		Australia, ABC NT Alice Springs	2310do
1500	1600		Australia, ABC NT Katherine	2485do
1500	1600		Australia, Radio Australia	5995pa
			7240pa	9475as
			9590pa	11660as
1500	1600		Bahrain, Radio Bahrain	6010me
1500	1600		Bhutan, Bhutan Broadcasting Service	6035do
1500	1600	Sat/Sun	Canada, CBC Northern Quebec Service	
			9625na	
1500	1600		Canada, CFRX Toronto ON	6070na
1500	1600		Canada, CFVP Calgary AB	6030na
1500	1600		Canada, CKZN St Johns NF	6160na
1500	1600		Canada, CKZU Vancouver BC	6160na
1500	1600		Canada, Radio Canada International	11675as
			15125as	
1500	1600		China, China Radio International	5955as
			6095me	7325as
			7395as	9720me
			9765va	9800as
			9870as	11965eu
			13640eu	13730na
			13760eu	17630af
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa/Malabo	
			15190af	
1500	1600		Italy, IRRS-Shortwave/European Gospel Radio	
			7290va	
1500	1600		Malaysia, RTM Kajang/Traxx FM	7295do
1500	1600		Nigeria, Voice of Nigeria	15120af
1500	1600	DRM	Russia, Voice of Russia	7225eu
1500	1600		Russia, Voice of Russia	4975va
			9660as	
			11985va	12040eu
1500	1600	mtwhf	South Africa, Channel Africa	9625af
1500	1600		South Africa, CVC 1 Africa Radio	13590af
1500	1600		Uganda, Dunamis Shortwave	4750af
1500	1600		UK, BBC World Service	5845as
			6190af	6195as
			7435af	9540as
			9740as	12095as
			13820as	15310as
			15400af	15420af
			17640af	17830af
			21470af	
1500	1600		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb
			7812usb	12133usb
			12759usb	13362usb
1500	1600		USA, BBG/Voice of America	4930af
			7540as	12080af
			12150va	13750va
			15530va	15580af
1500	1600		USA, BBG/Voice of America/Special English	
			6140af	7465va
			9485va	9760va
1500	1600		USA, EWTN/WEWN Irondale, AL	15610va
1500	1600		USA, FBN/WTJC Newport NC	9370na
1500	1600		USA, KNLS Anchor Point AK	9920as
1500	1600		USA, Overcomer Ministries	9655eu
			17485af	
1500	1600		USA, WBCQ Monticello ME	9330usb
1500	1600		USA, WHRI Cypress Creek SC	7385af
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC	9840af
1500	1600	Sat	USA, WHRI Cypress Creek SC	17510af
1500	1600	Sun	USA, WHRI Cypress Creek SC	15195va
1500	1600		USA, WJHR International Milton FL	15550na
1500	1600		USA, WRMI Miami FL	9955na
1500	1600		USA, WWCN Nashville TN	9980af
			13845na	15825eu
1500	1600		USA, WWRB Manchester TN	9385na

1500 1600	USA, WYFR/Family Radio Worldwide	11605as
	11830na 11910na 17795ca	17580af
1500 1600	Zambia, CVC Radio Christian Voice	13590af
1500 1600	Zambia, ZNBC/Radio Two	6165do
1515 1530	Australia, HCJB Global Australia	15340as
1515 1545 Sat	Canada, Bible Voice Broadcasting	13670as
1525 1555 Sat/Sun	Swaziland, TWR Africa	4760af
1530 1540 Sat	Vatican City State, Vatican Radio	11850as
	13765as 15235as	
1530 1545	India, All India Radio/Aizawl	5050do
1530 1545	India, All India Radio/Bengaluru	9425do
1530 1545	India, All India Radio/Bhopal	4810do
1530 1545	India, All India Radio/Chennai	4920do
1530 1545	India, All India Radio/Delhi	5015do
1530 1545	India, All India Radio/External Service	9910as
1530 1545	India, All India Radio/Guwahati	4940do
1530 1545	India, All India Radio/Hyderabad	4800do
1530 1545	India, All India Radio/Itanagar	4990do
1530 1545	India, All India Radio/Jaipur	4910do
1530 1545	India, All India Radio/Kolkata	4820do
1530 1545	India, All India Radio/Kurseong	4895do
1530 1545	India, All India Radio/Lucknow	4880do
1530 1545	India, All India Radio/Panaji, Goa	9820do
1530 1545	India, All India Radio/Port Blair	4760do
1530 1545	India, All India Radio/Radio Kashmir	4950do
1530 1545	India, All India Radio/Shillong	4970do
1530 1545	India, All India Radio/Shimla	4965do
1530 1545	India, All India Radio/Thiruvananthapuram	5010do
1530 1600 DRM	Belgium, TDP Radio/Disco Palace	15775as
1530 1600 Sun	Canada, Bible Voice Broadcasting	13590me
1530 1600 h	Canada, Bible Voice Broadcasting	13670as
1530 1600	Germany, AWR Europe	15255as
1530 1600	Iran, IRIB/ VOIRI	9600as 11945as
1530 1600	Mongolia, Voice of Mongolia	12015as
1530 1600	Myanmar, Myanma Radio/National Svc	5985do
1545 1600 mtwhfa	Canada, Bible Voice Broadcasting	13590me
1551 1600	New Zealand, Radio NZ International	7440pa
1551 1600 DRM	New Zealand, Radio NZ International	6170pa

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600 1605 Sun	Croatia, Croatian Radio	6165eu
1600 1615 if	Canada, Bible Voice Broadcasting	13590me
1600 1615 mtwhfa	Croatia, Croatian Radio	6165eu
1600 1627	Iran, IRIB/ VOIRI	9600as 11945as
1600 1630	Australia, Radio Australia	9965pa
1600 1630 DRM	Belgium, TDP Radio/Disco Palace	15775as
1600 1630	Guam, AWR/KSDA	11805as 12035as
1600 1630	Myanmar, Myanma Radio/National Svc	5985do
1600 1630	Vietnam, Voice of Vietnam/Overseas Service	7220me 7280eu 9550me 9730eu
1600 1645 h	Canada, Bible Voice Broadcasting	13590me
1600 1645	USA, WYFR/Family Radio Worldwide	11830na 11865na
1600 1657	North Korea, Voice of Korea	9990va 11545va
1600 1658	Germany, Deutsche Welle	6170as
1600 1659	Germany, Deutsche Welle	15410as
1600 1700	Anguilla, University Network	11775na
1600 1700	Australia, ABC NT Alice Springs	2310do
1600 1700	Australia, ABC NT Katherine	2485do
1600 1700	Australia, Radio Australia	5995pa 6080as
1600 1700	7240pa 9475as 9710pa	11660as
1600 1700	Bahrain, Radio Bahrain	6010me
1600 1700	Bhutan, Bhutan Broadcasting Service	6035do
1600 1700 Sat/Sun	Canada, Bible Voice Broadcasting	13590me
1600 1700 Sat	Canada, CBC Northern Quebec Service	9625na
1600 1700	Canada, CFRX Toronto ON	6070na
1600 1700	Canada, CFVP Calgary AB	6030na
1600 1700	Canada, CKZN St Johns NF	6160na
1600 1700	Canada, CKZU Vancouver BC	6160na
1600 1700	China, China Radio International	6060as
	7420af 7235as 9570af 11900af	
	11940eu 11965eu 13760eu	
1600 1700	Egypt, Radio Cairo	15345af
1600 1700 Sat/Sun	Equatorial Guinea, Radio East Africa/Malabo	15190af
1600 1700	Ethiopia, Radio Ethiopia	7235va 9560va
1600 1700	Italy, IRRS-Shortwave/European Gospel Radio	7290va
1600 1700	Malaysia, RTM Kajang/Traxx FM	7295do
1600 1700 DRM	New Zealand, Radio NZ International	6170pa
1600 1700	New Zealand, Radio NZ International	7440pa
1600 1700	Russia, Voice of Russia	4975va 11985va
	12040eu	

1600 1700	South Africa, CVC 1 Africa Radio	13590af
1600 1700	South Korea, KBS World Radio	9515eu
	9640as	
1600 1700	Taiwan, Radio Taiwan International	9435as
	15485as	
1600 1700	Uganda, Dunamis Shortwave	4750af
1600 1700	UK, BBC World Service	3255af 5845as
	5975as 6190af 9495as	12095as
	13820as 15400af 15420af	17640af
	17795af 17830af 21470af	
1600 1700	USA, American Forces Network/AFRTS	4319usb
	5446usb 5765usb 7812usb	12133usb
	12759usb 13362usb	
1600 1700	USA, BBG/Voice of America	4930af 6080af
	15580af	
1600 1700	USA, BBG/Voice of America/Special English	
	11890va 12080va 13750va	
1600 1700	USA, EWTN/WEWN Irondale, AL	15610va
1600 1700	USA, FBN/WTJC Newport NC	9370na
1600 1700	USA, WBCQ Monticello ME	9330usb
1600 1700	USA, WHRI Cypress Creek SC	7385af
	9840af 17520af	
1600 1700	USA, WJHR International Milton FL	15550na
1600 1700	USA, WRMI Miami FL	9955na
1600 1700	USA, WWCR Nashville TN	9980af 12160af
	13845na 15825eu	
1600 1700	USA, WWRB Manchester TN	9385na
1600 1700	USA, WYFR/Family Radio Worldwide	6085ca
	11850as 13695na 17545af	17795ca
	18980eu 21525af	
1600 1700	Zambia, CVC Radio Christian Voice	13590af
1600 1700	Zambia, ZNBC/Radio Two	6165do
1630 1700	China, Xizang PBS/Lhasa	4905do 4920do
	6025do 6110do 6130do	7255do
	7385do	
1630 1700	Guam, AWR/KSDA	11740as
1630 1700	Palau, T8WH/ WHRI	9930as
1630 1700 m	South Africa, SA Radio League	3230af
1630 1700	Turkey, Voice of Turkey	15520as

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700 1720 t	Canada, Bible Voice Broadcasting	13590me
1700 1725	Turkey, Voice of Turkey	15520as
1700 1729 DRM	Romania, Radio Romania International	7350eu
1700 1730 Sat	Canada, Bible Voice Broadcasting	13590me
1700 1730 m	South Africa, SA Radio League	3230af
1700 1730	Vietnam, Voice of Vietnam/Overseas Service	9625eu
1700 1755 mtwhf	South Africa, Channel Africa	9675af
1700 1757 DRM	Romania, Radio Romania International	9535eu
1700 1757	Romania, Radio Romania International	11735eu
1700 1759 DRM	Poland, Polskie Radio Warsaw	7265eu
1700 1759	Poland, Polskie Radio Warsaw	7265eu
	9770eu	
1700 1800	Anguilla, University Network	11775na
1700 1800	Australia, ABC NT Alice Springs	2310do
1700 1800	Australia, ABC NT Katherine	2485do
1700 1800	Australia, Radio Australia	5995pa 6080as
	9475as 9580pa 9710pa	11880pa
1700 1800	Bahrain, Radio Bahrain	6010me
1700 1800 Sat/Sun	Canada, Bible Voice Broadcasting	11960me
1700 1800 Sat	Canada, CBC Northern Quebec Service	9625na
1700 1800	Canada, CFRX Toronto ON	6070na
1700 1800	Canada, CFVP Calgary AB	6030na
1700 1800	Canada, CKZN St Johns NF	6160na
1700 1800	Canada, CKZU Vancouver BC	6160na
1700 1800	China, China Radio International	6090as
	6140as 6145eu 6165me	7235as
	7265as 7410as 7420as	11900af
	13760af	
1700 1800	Egypt, Radio Cairo	15345af
1700 1800 Sat/Sun	Equatorial Guinea, Radio Africa	7190af
1700 1800	Italy, IRRS-Shortwave/European Gospel Radio	7290va
1700 1800	Malaysia, RTM Kajang/Traxx FM	7295do
1700 1800	New Zealand, Radio NZ International	7440pa
1700 1800 DRM	New Zealand, Radio NZ International	6170pa
1700 1800	Palau, T8WH/ WHRI	9930as
1700 1800	Russia, Voice of Russia	4975as 11985af
	12040eu	
1700 1800	South Africa, CVC 1 Africa Radio	4965af
	13590af	
1700 1800	Swaziland, TWR Africa	3200af
1700 1800 Sat	Swaziland, TWR Africa	3200af
1700 1800	Taiwan, Radio Taiwan International	15690af

1700	1800	UK, BBC World Service	3255af	5845as
		5975as	6190af	7405af
		9410af	9495as	12095af
		17795af	17830af	
1700	1800	USA, American Forces Network/AFRTS	4319usb	
		5446usb	5765usb	7812usb
		12759usb	13362usb	
1700	1800	USA, BBG/Voice of America	6080af	12015af
		15580af	17895af	
1700	1800	USA, EWTN/WEWN Irondale, AL	15610va	
1700	1800	USA, FBN/WTJC Newport NC	9370na	
1700	1800	USA, WBCQ Monticello ME	9330usb	15420usb
1700	1800	USA, WHRI Cypress Creek SC	7385af	
		9840af	17520af	
1700	1800	USA, WJHR International Milton FL	15550na	
1700	1800	USA, WRMI Miami FL	9955ca	
1700	1800	USA, WWCR Nashville TN	9980af	12160af
		13845na	15825eu	
1700	1800	USA, WWRB Manchester TN	9385na	
1700	1800	USA, WYFR/Family Radio Worldwide	7395af	
		13690na	17555eu	17795eu
1700	1800	Zambia, CVC Radio Christian Voice	4965af	
		13590af		
1700	1800	Zambia, ZNBC/Radio Two	6165do	
1720	1740	USA, BBG/Voice of America/Studio 7	4930af	
		12130af	15730af	
1730	1745	India, All India Radio/Bhopal	4810do	
1730	1745	India, All India Radio/Delhi	5015do	7370do
		9575do	9835do	
1730	1745	India, All India Radio/Guwahati	4940do	
1730	1745	India, All India Radio/Hyderabad	4800do	
1730	1745	India, All India Radio/Jaipur	4910do	
1730	1745	India, All India Radio/Kolkata	4820do	
1730	1745	India, All India Radio/Kurseong	4895do	
1730	1745	India, All India Radio/Lucknow	4880do	
1730	1745	India, All India Radio/Radio Kashmir	4950do	
1730	1745	India, All India Radio/Shimla	4965do	
1730	1745	India, All India Radio/Thiruvananthapuram	5010do	
1730	1800	Bulgaria, Radio Bulgaria	5900eu	7400eu
1730	1800	Clandestine, Sudan Radio Service/SRS	9590af	
1730	1800	USA, BBG/Voice of America/Studio 7	4930af	
		12130af	15730af	
1730	1800	Vatican City State, Vatican Radio	11625af	
		13765af	15570af	
1740	1745	India, All India Radio/Chennai	4920do	
1745	1800	India, All India Radio/External Service	9950eu	
		11580af		
1745	1800	India, All India Radio/External Service	7400af	
		7410af	7550eu	9415af
		11670eu	11935af	
1759	1800	Netherlands, R Netherlands Worldwide	6020af	
		15495af		

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1815	Sun	Canada, Bible Voice Broadcasting	13590me
1800	1815	Sat	Canada, Bible Voice Broadcasting	11855as
1800	1830		South Africa, AWR Africa	3215af
1800	1830	w	South Africa, AWR Africa	9755af
1800	1830		USA, BBG/Voice of America	6080af
			12015af	15580af
1800	1830	Sat/Sun	USA, BBG/Voice of America	4930af
1800	1835		New Zealand, Radio NZ International	7440pa
1800	1835	DRM	New Zealand, Radio NZ International	6170pa
1800	1845	Sun	Canada, Bible Voice Broadcasting	9430me
1800	1857		Netherlands, R Netherlands Worldwide	6020af
			15495af	
1800	1857		North Korea, Voice of Korea	13760eu
1800	1900		Anguilla, University Network	11775na
1800	1900	mtwhf	Argentina, RAE	15345eu
1800	1900		Australia, ABC NT Alice Springs	2310do
1800	1900		Australia, ABC NT Katherine	2485do
1800	1900		Australia, Radio Australia	6080pa
			9475as	9580pa
			9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me
1800	1900	Sat	Canada, Bible Voice Broadcasting	9430me
1800	1900	Sun	Canada, Bible Voice Broadcasting	6030eu
1800	1900		Canada, CFRX Toronto ON	6070na
1800	1900		Canada, CFVP Calgary AB	6030na
1800	1900		Canada, CKZN St Johns NF	6160na
1800	1900		Canada, CKZU Vancouver BC	6160na
1800	1900		Canada, Radio Canada International	9530af
			11765af	17810af
1800	1900		China, China Radio International	6175eu
			9600eu	13760eu
1800	1900	Sat/Sun	Equatorial Guinea, Radio Africa	7190af

1800	1900	DRM	India, All India Radio/External Service	9950eu
			11580af	
1800	1900		India, All India Radio/External Service	7400af
			7410af	7550eu
			9415af	9445af
			11670eu	11935af
1800	1900		Italy, IRRS-Shortwave/European Gospel Radio	7290va
1800	1900		Kuwait, Radio Kuwait	15540eu
1800	1900		Malaysia, RTM Kajang/Traxx FM	7295do
1800	1900		Nigeria, Voice of Nigeria	15120af
1800	1900		Palau, T8WH/ WHRI	9930as
1800	1900		Russia, Voice of Russia	4975me
1800	1900		South Africa, CVC 1 Africa Radio	4965af
			13590af	
1800	1900		South Korea, KBS World Radio	7275eu
1800	1900		Swaziland, TWR Africa	9500af
1800	1900		Taiwan, Radio Taiwan International	6155eu
1800	1900		UK, BBC World Service	3255af
			11765va	11810af
			12095af	15400af
1800	1900		USA, American Forces Network/AFRTS	4319usb
			5446usb	5765usb
			7812usb	12133usb
			12759usb	13362usb
1800	1900		USA, EWTN/WEWN Irondale, AL	15610va
1800	1900		USA, FBN/WTJC Newport NC	9370na
1800	1900		USA, KJES Vado NM	15385na
1800	1900		USA, WBCQ Monticello ME	9330usb
1800	1900		USA, WHRI Cypress Creek SC	7385af
			9840af	17520af
1800	1900		USA, WJHR International Milton FL	15550na
1800	1900		USA, WRMI Miami FL	9955ca
1800	1900		USA, WWCR Nashville TN	9980af
			13845na	15825eu
1800	1900		USA, WWRB Manchester TN	9385na
1800	1900		USA, WYFR/Family Radio Worldwide	5905af
			7395af	9770af
			9925af	13615na
			13750af	13690na
			17795ca	17845af
			18980eu	
1800	1900		Zambia, CVC Radio Christian Voice	4965af
			13590af	
1800	1900		Zambia, ZNBC/Radio Two	6165do
1805	1810	Sat	Croatia, Croatian Radio	6165eu
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu
1815	1845	Sat	Canada, Bible Voice Broadcasting	6030eu
1830	1845		Croatia, Croatian Radio	15540na
1830	1845		India, All India Radio/Delhi	5015do
1830	1900		Moldova, (Transnistria) Radio PMR	6240eu
1830	1900		South Africa, AWR Africa	9610af
1830	1900		Turkey, Voice of Turkey	9785eu
1830	1900		UK, BBC World Service	9850as
			5905af	5950as
			5950as	5975as
			6190af	
1830	1900		UK, BBC World Service	9410af
1830	1900		USA, BBG/Voice of America	4930af
			9850af	12015af
			15580af	
1836	1850		New Zealand, Radio NZ International	9615pa
1836	1850	DRM	New Zealand, Radio NZ International	9890pa
1845	1900	mtwhf	Albania, Radio Tirana	7520na
1851	1900		New Zealand, Radio NZ International	9615pa
1851	1900	DRM	New Zealand, Radio NZ International	15720pa
1859	1900		Netherlands, R Netherlands Worldwide	7425af
			11610af	

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1925		Turkey, Voice of Turkey	9785eu
1900	1930		Germany, Deutsche Welle	6150af
			11795af	17610af
1900	1930		USA, BBG/Voice of America	4930af
			6080af	9850af
			15580af	17895af
1900	1930		Vietnam, Voice of Vietnam/Overseas Service	7280eu
			9730eu	
1900	1945	DRM	India, All India Radio/External Service	9950eu
			11580af	
1900	1945		India, All India Radio/External Service	7400af
			7410af	7550eu
			9415af	9445af
			11670eu	11935af
1900	1945		USA, WYFR/Family Radio Worldwide	6085ca
1900	1950		New Zealand, Radio NZ International	9615pa
1900	1957		Netherlands, R Netherlands Worldwide	7425af
			11615af	15195af
1900	1957		North Korea, Voice of Korea	7210af
			11535va	11910af
1900	2000		Anguilla, University Network	11775na
1900	2000		Australia, ABC NT Alice Springs	2310do
1900	2000		Australia, ABC NT Katherine	2485do
1900	2000		Australia, Radio Australia	6080pa
			9500as	9580pa
			9710pa	11880pa

1900	2000		Bahrain, Radio Bahrain	6010me	
1900	2000		Canada, CFRX Toronto ON	6070na	
1900	2000		Canada, CFVP Calgary AB	6030na	
1900	2000		Canada, CKZN St Johns NF	6160na	
1900	2000		Canada, CKZU Vancouver BC	6160na	
1900	2000		China, China Radio International	7295va	
			9435af	9440af	
1900	2000		Cuba, Radio Havana Cuba	11760sa	
1900	2000		Egypt, Radio Cairo	11510af	
1900	2000	Sat/Sun	Equatorial Guinea, Radio Africa	7190af	
1900	2000		Indonesia, Voice of Indonesia	9526eu	
1900	2000		Italy, IRRS-Shortwave/European Gospel Radio		
			7290va		
1900	2000		Kuwait, Radio Kuwait	15540eu	
1900	2000		Malaysia, RTM Kajang/Traxx FM	7295do	
1900	2000		Micronesia, The Cross Radio/Pohnpei	4755as	
1900	2000	DRM	New Zealand, Radio NZ International	15720pa	
1900	2000		Palau, T8WH/ WHRI	9930as	
1900	2000		Russia, Voice of Russia	12040va	
1900	2000		South Africa, CVC 1 Africa Radio	4965af	
			13590af		
1900	2000	mtwhf	Spain, Radio Exterior de Espana	9665eu	
			11610af		
1900	2000		Swaziland, TWR Africa	3200af	
1900	2000	Sat	Swaziland, TWR Africa	3200af	
1900	2000		Thailand, Radio Thailand World Service	7205eu	
1900	2000		UK, BBC World Service	3255af	5875as
			5950as	6005af	6190af
			11810af	12095af	15400af
1900	2000		USA, American Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb
			12759usb	13362usb	12133usb
1900	2000		USA, BBG/Voice of America/Special English		
			7485va	9630va	
1900	2000		USA, EWTN/WEWN Irondale, AL	15610va	
1900	2000		USA, FBN/WTJC Newport NC	9370na	
1900	2000		USA, WBCQ Monticello ME	7415usb	9330usb
			15420usb		
1900	2000		USA, WHRI Cypress Creek SC	7385af	
			9840af	17520na	
1900	2000		USA, WJHR International Milton FL	15550na	
1900	2000		USA, WRMI Miami FL	9955ca	
1900	2000		USA, WWCR Nashville TN	9980af	12160af
			13845na	15825eu	
1900	2000		USA, WWRB Manchester TN	9385na	
1900	2000		USA, WYFR/Family Radio Worldwide	3230af	
			6020af	7270af	7395af
			9775af	13615na	13690na
			17845af	18930eu	18980eu
1900	2000		Zambia, CVC Radio Christian Voice	4965af	
			13590af		
1900	2000		Zambia, ZNBC/Radio Two	6165do	
1905	1920	Sat	Mali, ORTM/Radio Mali	9635do	
1930	2000	Sat/Sun	Germany, Pan American Broadcasting	9515af	
1930	2000		Iran, IRI/ VOIRI	5940eu	6205eu
			9800af		9780eu
1930	2000		South Africa, RTE Radio Worldwide	5840af	
1930	2000		USA, BBG/Voice of America	4930af	4940af
			6080af	15580af	
1945	2000	DRM	Vatican City State, Vatican Radio	9800am	
1950	2000		Vatican City State, Vatican Radio	4005va	
			5885va	7250va	9645va
1951	2000		New Zealand, Radio NZ International	11725pa	

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2015	Sat	Germany, Pan American Broadcasting	9515af	
2000	2027		Iran, IRI/ VOIRI	5940eu	6205eu
			9800af		9780eu
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13735na
2000	2030		Egypt, Radio Cairo	11510af	
2000	2030		South Africa, RTE Radio Worldwide	5840af	
2000	2030	Sat	Swaziland, TWR Africa	3200af	
2000	2030		USA, BBG/Voice of America	4930af	4940af
			6080af	15580af	
2000	2030		Vatican City State, Vatican Radio	7365af	
			9755af	11625af	
2000	2045		USA, WYFR/Family Radio Worldwide	17750eu	
2000	2050		New Zealand, Radio NZ International	11725pa	
2000	2050	DRM	New Zealand, Radio NZ International	15720pa	
2000	2057		Germany, Deutsche Welle	6150af	11795af
			11865af		
2000	2057		Netherlands, R Netherlands Worldwide	7425af	
			11615af		
2000	2100		Anguilla, University Network	11775na	
2000	2100		Australia, ABC NT Alice Springs	2310do	

2000	2100		Australia, ABC NT Katherine	2485do	
2000	2100		Australia, ABC NT Tennant Creek	2325do	
2000	2100		Australia, Radio Australia	6080pa	7240pa
			9500as	11650pa	11660pa
2000	2100		Bahrain, Radio Bahrain	6010me	
2000	2100		Belarus, Radio Station Belarus	7255eu	
			7360eu	7390eu	
2000	2100	DRM	Belgium, TDP Radio/Disco Palace	17755am	
2000	2100		Canada, CFRX Toronto ON	6070na	
2000	2100		Canada, CFVP Calgary AB	6030na	
2000	2100		Canada, CKZN St Johns NF	6160na	
2000	2100		Canada, CKZU Vancouver BC	6160na	
2000	2100		Canada, Radio Canada International	15235af	
			15330af	17735af	
2000	2100		China, China Radio International	5960eu	
			5985af	7285eu	7415eu
			9600eu		9440af
2000	2100	Sat/Sun	Equatorial Guinea, Radio Africa	7190af	
2000	2100		Kuwait, Radio Kuwait	15540eu	
2000	2100		Malaysia, RTM Kajang/Traxx FM	7295do	
2000	2100		Micronesia, The Cross Radio/Pohnpei	4755as	
2000	2100		Palau, T8WH/ WHRI	9930as	
2000	2100		Russia, Voice of Russia	12040va	
2000	2100		South Africa, CVC 1 Africa Radio	4965af	
			9505af		
2000	2100		UK, BBC World Service	3255af	6005af
			6190af	9410af	11810af
			13710af		12095af
2000	2100		USA, American Forces Network/AFRTS	4319usb	
			5446usb	5765usb	7812usb
			12759usb	13362usb	12133usb
2000	2100	mtwhf	USA, BBG/Voice of America	5930va	9480va
2000	2100		USA, EWTN/WEWN Irondale, AL	15610af	
2000	2100		USA, FBN/WTJC Newport NC	9370na	
2000	2100		USA, WBCQ Monticello ME	7415usb	9330usb
			15420usb		
2000	2100		USA, WHRI Cypress Creek SC	7385na	
			15665na		
2000	2100		USA, WJHR International Milton FL	15550na	
2000	2100		USA, WRMI Miami FL	9955ca	
2000	2100		USA, WWCR Nashville TN	9980af	12160af
			13845na	15825eu	
2000	2100		USA, WWRB Manchester TN	9385na	
2000	2100		USA, WYFR/Family Radio Worldwide	7540eu	
			11690af	12060af	15195af
			17795ca	17845af	18980eu
2000	2100		Zambia, CVC Radio Christian Voice	4965af	
			9505af		
2000	2100		Zambia, ZNBC/Radio Two	6165do	
2030	2045		Thailand, Radio Thailand World Service	9680eu	
2030	2057	DRM	Romania, Radio Romania International	9765eu	
2030	2057		Romania, Radio Romania International	11880na	
			11940na	13800na	
2030	2100		Moldova, (Transnistria) Radio PMR	6240eu	
2030	2100		Turkey, Voice of Turkey	7205va	
2030	2100		USA, BBG/Voice of America	4930af	6080af
			7555as	15580af	
2030	2100	Sat/Sun	USA, BBG/Voice of America	4940af	
2030	2100		Vietnam, Voice of Vietnam/Overseas Service		
			7220me	7280eu	9550me
					9730eu
2045	2100		India, All India Radio/External Service	7550eu	
			9445eu	9910pa	11620pa
			11715pa		11670eu
2045	2100	DRM	India, All India Radio/External Service	9950eu	
2051	2100	DRM	New Zealand, Radio NZ International	11675pa	
2051	2100		New Zealand, Radio NZ International	11725pa	

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2125		Turkey, Voice of Turkey	7205va	
2100	2130		Australia, ABC NT Alice Springs	2310do	
2100	2130		Australia, ABC NT Katherine	2485do	
2100	2130		Australia, ABC NT Tennant Creek	2325do	
2100	2130		Austria, AWR Europe	11955af	
2100	2130	Sat	Canada, CBC Northern Quebec Service		
			9625na		
2100	2130		South Korea, KBS World Radio	3955eu	
2100	2145		USA, WYFR/Family Radio Worldwide	13615na	
			13690na	17795ca	18980eu
2100	2150	DRM	New Zealand, Radio NZ International	11675pa	
2100	2150		New Zealand, Radio NZ International	11725pa	
2100	2157		North Korea, Voice of Korea	13760eu	15245eu
2100	2200		Angola, Angolan National Radio	7217af	
2100	2200		Anguilla, University Network	11775na	
2100	2200		Australia, Radio Australia	9500as	9660pa
			11660pa	11650pa	11695as
			15515pa		13630pa

2100	2200	Bahrain, Radio Bahrain	6010me	
2100	2200	Belarus, Radio Station Belarus	7255eu	
		7360eu 7390eu		
2100	2200	DRM Belgium, TDP Radio	17555eu	
2100	2200	Bulgaria, Radio Bulgaria	5900eu	7400eu
2100	2200	Canada, CFRX Toronto ON	6070na	
2100	2200	Canada, CFVP Calgary AB	6030na	
2100	2200	Canada, CKZN St Johns NF	6160na	
2100	2200	Canada, CKZU Vancouver BC	6160na	
2100	2200	DRM Canada, Radio Canada International	9800na	
2100	2200	China, China Radio International	5960eu	
		7205af 7285eu 7325af	7415eu	
		9500eu		
2100	2200	Sat/Sun Equatorial Guinea, Radio Africa	7190af	
2100	2200	India, All India Radio/External Service	7550eu	
		9445eu 9910pa 11620pa	11715pa	
2100	2200	DRM India, All India Radio/External Service	9950eu	
2100	2200	Malaysia, RTM Kajang/Traxx FM	7295do	
2100	2200	Micronesia, The Cross Radio/Pohnpei	4755 as	
2100	2200	Palau, T8WH/ WHRI	9930as	
2100	2200	South Africa, CVC 1 Africa Radio	4965af	
		9505af		
2100	2200	Sat/Sun Spain, Radio Exterior de Espana	9650eu	
2100	2200	Syria, Radio Damascus	9330va	12085va
2100	2200	UK, BBC World Service	3255af	3915as
		5875as 5905as 6005af	6190af	
		6195as 9410af 9915af	12095af	
2100	2200	USA, American Forces Network/AFRTS	4319usb	12133usb
		5446usb 5765usb 7812usb		
		12759usb 13362usb		
2100	2200	USA, BBG/Voice of America	6080af	7555as
		15580af		
2100	2200	USA, EWTN/WEWN Irondale, AL	15610af	
2100	2200	USA, FBN/WTJC Newport NC	9370na	
2100	2200	USA, WBCQ Monticello ME	7415usb	9330usb
2100	2200	USA, WHRI Cypress Creek SC	7385na	
		13660na		
2100	2200	USA, WJHR International Milton FL	15550na	
2100	2200	USA, WRMI Miami FL	9955ca	
2100	2200	USA, WWCR Nashville TN	7465eu	9350af
		9980af 13845na		
2100	2200	USA, WWRB Manchester TN	3215na	
2100	2200	USA, WYFR/Family Radio Worldwide	7425af	
		12060af 17845af		
2100	2200	Zambia, CVC Radio Christian Voice	4965af	
		9505af		
2100	2200	Zambia, ZNBC/Radio Two	6165do	
2115	2200	Egypt, Radio Cairo	6270eu	
2130	2200	Australia, ABC NT Alice Springs	4835do	
2130	2200	Australia, ABC NT Katherine	5025do	
2130	2200	mtwhfa Canada, CBC Northern Quebec Service	9625na	
2151	2200	DRM New Zealand, Radio NZ International	17675pa	
2151	2200	New Zealand, Radio NZ International	15720pa	

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2205	Zambia, ZNBC/Radio Two	6165do	
2200	2230	India, All India Radio/External Service	7550eu	
		9445eu 9445eu 9910pa	11620pa	
		11670eu 11715pa		
2200	2230	DRM India, All India Radio/External Service	9950eu	
2200	2245	Egypt, Radio Cairo	6270eu	
2200	2245	USA, WYFR/Family Radio Worldwide	15770af	
2200	2255	Turkey, Voice of Turkey	9830va	
2200	2257	Romania, Radio Romania International	5960eu	
		7435eu 9790eu 11940eu		
2200	2300	Anguilla, University Network	6090na	
2200	2300	Australia, ABC NT Alice Springs	4835do	
2200	2300	Australia, ABC NT Katherine	5025do	
2200	2300	Australia, Radio Australia	9660pa	9855as
		13630pa 15230pa 15515pa	15560pa	
2200	2300	Bahrain, Radio Bahrain	6010me	
2200	2300	smtwhf Canada, CBC Northern Quebec Service	9625na	
2200	2300	Canada, CFRX Toronto ON	6070na	
2200	2300	Canada, CFVP Calgary AB	6030na	
2200	2300	Canada, CKZN St Johns NF	6160na	
2200	2300	Canada, CKZU Vancouver BC	6160na	
2200	2300	China, China Radio International	9590as	
2200	2300	Sat/Sun Equatorial Guinea, Radio Africa	7190af	
2200	2300	Malaysia, RTM Kajang/Traxx FM	7295do	
2200	2300	Micronesia, The Cross Radio/Pohnpei	4755 as	
2200	2300	DRM New Zealand, Radio NZ International	17675pa	
2200	2300	New Zealand, Radio NZ International	15720pa	
2200	2300	Palau, T8WH/ WHRI	9930as	

2200	2300	Russia, Voice of Russia	9800va	
2200	2300	UK, BBC World Service	3915as	5875as
		5905as 5935af 6195as	7490as	
		9580as 9915af 12095af		
2200	2300	USA, American Forces Network/AFRTS	4319usb	12133usb
		5446usb 5765usb 7812usb		
		12759usb 13362usb		
2200	2300	smtwh USA, BBG/Voice of America	5915va	7480va
		7575va 11955va		
2200	2300	USA, BBG/Voice of America	7555as	
2200	2300	USA, EWTN/WEWN Irondale, AL	15610me	
2200	2300	USA, FBN/WTJC Newport NC	9370na	
2200	2300	USA, WBCQ Monticello ME	7415usb	9330usb
2200	2300	USA, WHRI Cypress Creek SC	9850na	
		9860na 13620na		
2200	2300	USA, WRMI Miami FL	9955ca	
2200	2300	USA, WWCR Nashville TN	7465eu	9350af
		9980af 13845na		
2200	2300	USA, WWRB Manchester TN	3215na	5050na
2200	2300	USA, WYFR/Family Radio Worldwide	5950na	
		15255sa 15440ca		
2200	2300	Zambia, CVC Radio Christian Voice	4965af	
2215	2230	Croatia, Croatian Radio	3985eu	7375sa
2230	2300	Moldova, (Transnistria) Radio PMR	6240eu	
2230	2300	South Africa, AWR Africa	15320as	
2230	2300	USA, BBG/Voice of America/Special English		
		7460af 9570va 11840va	15340va	
2245	2300	India, All India Radio/External Service	6055as	
		7305as 11645as 13605as		

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000	Anguilla, University Network	6090na	
2300	0000	Australia, ABC NT Alice Springs	4835do	
2300	0000	Australia, ABC NT Katherine	5025do	
2300	0000	Australia, Radio Australia	9660pa	13690pa
		15230pa 15415as 17795pa		
2300	0000	Bahrain, Radio Bahrain	6010me	
2300	0000	Bulgaria, Radio Bulgaria	9700na	11700na
2300	0000	smtwhf Canada, CBC Northern Quebec Service	9625na	
2300	0000	Canada, CFRX Toronto ON	6070na	
2300	0000	Canada, CFVP Calgary AB	6030na	
2300	0000	Canada, CKZN St Johns NF	6160na	
2300	0000	Canada, CKZU Vancouver BC	6160na	
2300	0000	China, China Radio International	5915as	
		5990ca 6145na 7350eu	7410as	
		9610as 11690as 11790as	11840na	
2300	0000	Cuba, Radio Havana Cuba	5040ca	
2300	0000	Egypt, Radio Cairo	6270na	
2300	0000	India, All India Radio/External Service	6055as	
		7305as 11645as 13605as		
2300	0000	Malaysia, RTM Kajang/Traxx FM	7295do	
2300	0000	Micronesia, The Cross Radio/Pohnpei	4755 as	
2300	0000	DRM New Zealand, Radio NZ International	17675pa	
2300	0000	Palau, T8WH/ WHRI	9930as	
2300	0000	Russia, Voice of Russia	9665va	9800va
2300	0000	UK, BBC World Service	7490as	9580as
		9740as 9890as 11850as	12010as	
2300	0000	USA, American Forces Network/AFRTS	4319usb	12133usb
		5446usb 5765usb 7812usb		
		12759usb 13362usb		
2300	0000	USA, BBG/Voice of America	5895va	7555as
		7575va 11955va		
2300	0000	USA, BBG/Voice of America/Special English		
		7460af 9570va 11840va	15340va	
2300	0000	USA, EWTN/WEWN Irondale, AL	15610me	
2300	0000	USA, FBN/WTJC Newport NC	9370na	
2300	0000	USA, WBCQ Monticello ME	7415usb	9330usb
2300	0000	USA, WHRI Cypress Creek SC	9850na	
2300	0000	Sun USA, WHRI Cypress Creek SC	7315na	
		17820va		
2300	0000	USA, WRMI Miami FL	9955ca	
2300	0000	USA, WWCR Nashville TN	7465eu	9350af
		9980af 13845na		
2300	0000	USA, WWRB Manchester TN	3215na	5050na
2300	0000	USA, WYFR/Family Radio Worldwide	5950na	
		11580sa 15440ca		
2300	0000	Zambia, CVC Radio Christian Voice	4965af	
2300	2330	DRM Vatican City State, Vatican Radio	9755am	
2300	2345	USA, WYFR/Family Radio Worldwide	11740na	
2330	0000	Australia, Radio Australia	17750as	
2330	0000	Vietnam, Voice of Vietnam/Overseas Service		
		9840as 12020as		
2330	2345	India, All India Radio/Aligarh	9470do	



MTXTRA

Shortwave Broadcast Guide



SPANISH

The following language schedule is extracted from our new *MTXtra Shortwave Broadcast Guide* pdf which is a free download to all *MTXpress* subscribers. This new online *Shortwave Broadcast Guide* has more than 9,100 station entries that include all languages being broadcasts via shortwave radio worldwide, sorted by time and updated monthly.

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0045	USA, WYFR/Family Radio Worldwide	15190sa
0000	0100	mtwhf Argentina, RAE	11710am
0000	0100	Brazil, Educadora/Braganca	4825do
0000	0100	Brazil, Radio 9 de Julho	9820do
0000	0100	Brazil, Radio A Nossa Voz	4974do
0000	0100	Brazil, Radio Alvorada/Londrina	4865do
0000	0100	Brazil, Radio Alvorada/Parintins	4965do
0000	0100	Brazil, Radio Aparecida	5035do 6135do
		9630do 11855do	
0000	0100	Brazil, Radio Bandeirantes	6090do 9645do
		11925do	
0000	0100	Brazil, Radio Boa Vontade	6160do 9550do
		11895do	
0000	0100	Brazil, Radio Brasil 5000	4785do
0000	0100	Brazil, Radio Brasil Central	4985do 11815do
0000	0100	Brazil, Radio Cancao Nova	4825do 6105do
		9675do	
0000	0100	Brazil, Radio Capixaba	4935do
0000	0100	Brazil, Radio Clube do Para	4885do
0000	0100	Brazil, Radio Congonhas	4775do
0000	0100	Brazil, Radio Cultura do Para	5045do
0000	0100	Brazil, Radio Cultura Ondas Tropicais	4845do
0000	0100	Brazil, Radio Cultura/Araquara	3365do
0000	0100	Brazil, Radio Cultura/Sao Paulo	6170do
		9615do	
0000	0100	Brazil, Radio Daqui	4915do 6080do
		11830do	
0000	0100	Brazil, Radio Difusora Acerana	4885do
0000	0100	Brazil, Radio Difusora Caceres	5055do
0000	0100	Brazil, Radio Difusora de Macapa	4915do
0000	0100	Brazil, Radio Difusora do Amazonas	4805do
0000	0100	Brazil, Radio Difusora Roraima	4875do
0000	0100	Brazil, Radio Difusora/Londrina	4815do
0000	0100	Brazil, Radio Educacao Rural/Coari	5035do
0000	0100	Brazil, Radio Educadora 6 de Agosto	3355do
0000	0100	Brazil, Radio Educadora/Limeira	2380do
0000	0100	Brazil, Radio Gaucha/Porto Alegre	6020do
0000	0100	Brazil, Radio Gaucha/Rio de Janeiro	11915do
0000	0100	Brazil, Radio Gazeta	9684do 15325do
0000	0100	Brazil, Radio Gazeta Universitaria	5955do
0000	0100	Brazil, Radio Globo	11805do
0000	0100	Brazil, Radio Guaiba	6000do 11784do
0000	0100	Brazil, Radio Guarujá Paulista	5045do
0000	0100	Brazil, Radio Imaculada Conceicao	4754do
0000	0100	Brazil, Radio Inconfidencia	6010do 15190do
0000	0100	Brazil, Radio Jornal A Critica	5055do
0000	0100	Brazil, Radio Maria	4885do
0000	0100	Brazil, Radio Missoes da Amazonia	4865do
0000	0100	Brazil, Radio Mundial	3325do
0000	0100	Brazil, Radio Municipal	3375do
0000	0100	Brazil, Radio Nacional da Amazonia	6180do
		11780do	
0000	0100	Brazil, Radio Novas de Paz	6080do 9515do
0000	0100	Brazil, Radio Novo Tempo	4895do
0000	0100	Brazil, Radio Record	6150do
0000	0100	Brazil, Radio Rural	4765do
0000	0100	Brazil, Radio Transmundial	9530do
0000	0100	Brazil, Radio Verdes Florestas	4865do
0000	0100	Brazil, Radio Voz Misionaria/Camboriu	9665do
0000	0100	Brazil, Radio Voz Misionaria/Florianopolis	11749do
0000	0100	Brazil, Super Radio Deus e Amour/Curitiba	6060do 11765do
0000	0100	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do 9585do
0000	0100	China, China Radio International	9560sa
		9710eu	
0000	0100	Portugal, RDP Internacional	9715na
0000	0100	mtwhfa USA, WYFR/Family Radio Worldwide	11580sa
		17725sa	

0030	0100	Vatican City State, Vatican Radio	6040am
		7305am	

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0145	USA, WYFR/Family Radio Worldwide	7520eu
0100	0200	Brazil, Educadora/Braganca	4825do
0100	0200	Brazil, Radio 9 de Julho	9820do
0100	0200	Brazil, Radio A Nossa Voz	4974do
0100	0200	Brazil, Radio Alvorada/Londrina	4865do
0100	0200	Brazil, Radio Alvorada/Parintins	4965do
0100	0200	Brazil, Radio Aparecida	5035do 6135do
		11855do	
0100	0200	Brazil, Radio Bandeirantes	6090do 9645do
		11925do	
0100	0200	Brazil, Radio Boa Vontade	6160do 9550do
		11895do	
0100	0200	Brazil, Radio Brasil Central	4985do 11815do
0100	0200	Brazil, Radio Cancao Nova	4825do 6105do
		9675do	
0100	0200	Brazil, Radio Capixaba	4935do
0100	0200	Brazil, Radio Clube do Para	4885do
0100	0200	Brazil, Radio Congonhas	4775do
0100	0200	Brazil, Radio Cultura do Para	5045do
0100	0200	Brazil, Radio Cultura Ondas Tropicais	4845do
0100	0200	Brazil, Radio Cultura/Sao Paulo	6170do
		9615do	
0100	0200	Brazil, Radio Daqui	6080do 11830do
0100	0200	Brazil, Radio Difusora Acerana	4885do
0100	0200	Brazil, Radio Difusora Caceres	5055do
0100	0200	Brazil, Radio Difusora de Macapa	4915do
0100	0200	Brazil, Radio Difusora Roraima	4875do
0100	0200	Brazil, Radio Difusora/Londrina	4815do
0100	0200	Brazil, Radio Educadora/Limeira	2380do
0100	0200	Brazil, Radio Gaucha/Porto Alegre	6020do
0100	0200	Brazil, Radio Gaucha/Rio de Janeiro	11915do
0100	0200	Brazil, Radio Gazeta	9684do 15325do
0100	0200	Brazil, Radio Gazeta Universitaria	5955do
0100	0200	Brazil, Radio Globo	11805do
0100	0200	Brazil, Radio Guaiba	6000do 11784do
0100	0200	Brazil, Radio Guarujá Paulista	5045do
0100	0200	Brazil, Radio Imaculada Conceicao	4754do
0100	0200	Brazil, Radio Inconfidencia	6010do 15190do
0100	0200	Brazil, Radio Jornal A Critica	5055do
0100	0200	Brazil, Radio Maria	4885do
0100	0200	Brazil, Radio Missoes da Amazonia	4865do
0100	0200	Brazil, Radio Mundial	3325do
0100	0200	Brazil, Radio Nacional da Amazonia	6180do
0100	0200	Brazil, Radio Novas de Paz	6080do 9515do
0100	0200	Brazil, Radio Novo Tempo	4895do
0100	0200	Brazil, Radio Record	6150do
0100	0200	Brazil, Radio Rural	4765do
0100	0200	Brazil, Radio Transmundial	9530do
0100	0200	Brazil, Radio Verdes Florestas	4865do
0100	0200	Brazil, Radio Voz Misionaria/Camboriu	9665do
0100	0200	Brazil, Radio Voz Misionaria/Florianopolis	11749do
0100	0200	Brazil, Super Radio Deus e Amour/Curitiba	6060do 11765do
0100	0200	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do 9585do
0100	0200	mtwhfa Portugal, RDP Internacional	9715na
0100	0200	USA, WYFR/Family Radio Worldwide	11530sa
		11550sa	

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0230	Brazil, Educadora/Braganca	4825do
0200	0300	Brazil, Radio 9 de Julho	9820do
0200	0300	Brazil, Radio A Nossa Voz	4974do

0200	0300	Brazil, Radio Alvorada/Londrina	4865do
0200	0300	Brazil, Radio Aparecida	5035do
0200	0300	Brazil, Radio Bandeirantes	6090do
		11925do	
0200	0300	Brazil, Radio Boa Vontade	6160do
		11895do	9550do
0200	0300	Brazil, Radio Brasil Central	4985do
0200	0300	Brazil, Radio Cancao Nova	4825do
		9675do	6105do
0200	0300	Brazil, Radio Capixaba	4935do
0200	0300	Brazil, Radio Clube do Para	4885do
0200	0300	Brazil, Radio Cultura do Para	5045do
0200	0300	Brazil, Radio Cultura/Sao Paulo	6170do
		9615do	
0200	0300	Brazil, Radio Difusora Acerana	4885do
0200	0300	Brazil, Radio Difusora Caceres	5055do
0200	0300	Brazil, Radio Difusora de Macapa	4915do
0200	0300	Brazil, Radio Difusora Roraima	4875do
0200	0300	Brazil, Radio Difusora/Londrina	4815do
0200	0300	Brazil, Radio Educadora/Limeira	2380do
0200	0300	Brazil, Radio Gaucha/Porto Alegre	6020do
0200	0300	Brazil, Radio Gazeta	9684do
0200	0300	Brazil, Radio Globo	11805do
0200	0300	Brazil, Radio Guaiba	6000do
0200	0300	Brazil, Radio Guarujá Paulista	5045do
0200	0300	Brazil, Radio Imaculada Conceicao	4754do
0200	0300	Brazil, Radio Inconfidencia	6010do
0200	0300	Brazil, Radio Jornal A Critica	5055do
0200	0300	Brazil, Radio Maria	4885do
0200	0300	Brazil, Radio Mundial	3325do
0200	0300	Brazil, Radio Nacional da Amazonia	6180do
0200	0300	Brazil, Radio Novo Tempo	4895do
0200	0300	Brazil, Radio Record	6150do
0200	0300	Brazil, Radio Rural	4765do
0200	0300	Brazil, Radio Voz Misionaria/Camboriu	9665do
0200	0300	Brazil, Radio Voz Misionaria/Florianopolis	11749do
0200	0300	Brazil, Super Radio Deus e Amour/Curitiba	6060do
0200	0300	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do
		9585do	
0200	0300	USA, WYFR/Family Radio Worldwide	11550sa

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0345	USA, WYFR/Family Radio Worldwide	11550sa
0300	0400	Brazil, Radio 9 de Julho	9820do
0300	0400	Brazil, Radio A Nossa Voz	4974do
0300	0400	Brazil, Radio Alvorada/Londrina	4865do
0300	0400	Brazil, Radio Bandeirantes	6090do
		11925do	9645do
0300	0400	Brazil, Radio Boa Vontade	6160do
		11895do	9550do
0300	0400	Brazil, Radio Brasil Central	4985do
0300	0400	Brazil, Radio Cancao Nova	4825do
		9675do	6105do
0300	0400	Brazil, Radio Capixaba	4935do
0300	0400	Brazil, Radio Clube do Para	4885do
0300	0400	Brazil, Radio Difusora Acerana	4885do
0300	0400	Brazil, Radio Difusora de Macapa	4915do
0300	0400	Brazil, Radio Difusora Roraima	4875do
0300	0400	Brazil, Radio Educadora/Limeira	2380do
0300	0400	Brazil, Radio Gaucha/Porto Alegre	6020do
0300	0400	Brazil, Radio Globo	11805do
0300	0400	Brazil, Radio Guarujá Paulista	5045do
0300	0400	Brazil, Radio Imaculada Conceicao	4754do
0300	0400	Brazil, Radio Inconfidencia	6010do
0300	0400	Brazil, Radio Jornal A Critica	5055do
0300	0400	Brazil, Radio Maria	4885do
0300	0400	Brazil, Radio Mundial	3325do
0300	0400	Brazil, Radio Nacional da Amazonia	6180do
0300	0400	Brazil, Radio Novo Tempo	4895do
0300	0400	Brazil, Radio Record	6150do
0300	0400	Brazil, Radio Voz Misionaria/Camboriu	9665do
0300	0400	Brazil, Radio Voz Misionaria/Florianopolis	11749do
0300	0400	Brazil, Super Radio Deus e Amour/Curitiba	6060do
0300	0400	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do
		9585do	
0300	0400	USA, WYFR/Family Radio Worldwide	7730sa

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0445	USA, WYFR/Family Radio Worldwide	11530af
0400	0500	Brazil, Radio 9 de Julho	9820do
0400	0500	Brazil, Radio A Nossa Voz	4974do
0400	0500	Brazil, Radio Alvorada/Londrina	4865do
0400	0500	Brazil, Radio Bandeirantes	6090do
		11925do	9645do
0400	0500	Brazil, Radio Boa Vontade	6160do
		11895do	9550do
0400	0500	Brazil, Radio Cancao Nova	4825do
		9675do	6105do
0400	0500	Brazil, Radio Capixaba	4935do
0400	0500	Brazil, Radio Clube do Para	4885do
0400	0500	Brazil, Radio Difusora de Macapa	4915do
0400	0500	Brazil, Radio Educadora/Limeira	2380do
0400	0500	Brazil, Radio Globo	11805do
0400	0500	Brazil, Radio Guarujá Paulista	5045do
0400	0500	Brazil, Radio Imaculada Conceicao	4754do
0400	0500	Brazil, Radio Inconfidencia	6010do
0400	0500	Brazil, Radio Jornal A Critica	5055do
0400	0500	Brazil, Radio Maria	4885do
0400	0500	Brazil, Radio Mundial	3325do
0400	0500	Brazil, Radio Nacional da Amazonia	6180do
0400	0500	Brazil, Radio Novo Tempo	4895do
0400	0500	Brazil, Radio Record	6150do
0400	0500	Brazil, Radio Voz Misionaria/Camboriu	9665do
0400	0500	Brazil, Radio Voz Misionaria/Florianopolis	11749do
0400	0500	Brazil, Super Radio Deus e Amour/Curitiba	6060do
0400	0500	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do
		9585do	

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0600	Brazil, Radio 9 de Julho	9820do
0500	0600	Brazil, Radio A Nossa Voz	4974do
0500	0600	Brazil, Radio Alvorada/Londrina	4865do
0500	0600	Brazil, Radio Bandeirantes	6090do
		11925do	9645do
0500	0600	Brazil, Radio Boa Vontade	6160do
		11895do	9550do
0500	0600	Brazil, Radio Cancao Nova	4825do
		9675do	6105do
0500	0600	Brazil, Radio Capixaba	4935do
0500	0600	Brazil, Radio Clube do Para	4885do
0500	0600	Brazil, Radio Difusora de Macapa	4915do
0500	0600	Brazil, Radio Educadora/Limeira	2380do
0500	0600	Brazil, Radio Globo	11805do
0500	0600	Brazil, Radio Guarujá Paulista	5045do
0500	0600	Brazil, Radio Imaculada Conceicao	4754do
0500	0600	Brazil, Radio Inconfidencia	6010do
0500	0600	Brazil, Radio Jornal A Critica	5055do
0500	0600	Brazil, Radio Maria	4885do
0500	0600	Brazil, Radio Mundial	3325do
0500	0600	Brazil, Radio Nacional da Amazonia	6180do
0500	0600	Brazil, Radio Novo Tempo	4895do
0500	0600	Brazil, Radio Record	6150do
0500	0600	Brazil, Radio Voz Misionaria/Camboriu	9665do
0500	0600	Brazil, Radio Voz Misionaria/Florianopolis	11749do
0500	0600	Brazil, Super Radio Deus e Amour/Curitiba	6060do
0500	0600	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do
		9585do	
0500	0600	Portugal, RDP Internacional	7240eu
0530	0559	Germany, Deutsche Welle	17800af
0530	0600	Brazil, Radio Aparecida	9630do
0530	0600	Germany, Deutsche Welle	11830af
0530	0600	Vatican City State, Vatican Radio	11625af
		13765af	15570af
0545	0600	Brazil, Radio Itatiaia	5970do

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0655	Portugal, RDP Internacional	7240eu
0600	0700	Brazil, Radio 9 de Julho	9820do
0600	0700	Brazil, Radio A Nossa Voz	4974do
0600	0700	Brazil, Radio Alvorada/Londrina	4865do
0600	0700	Brazil, Radio Bandeirantes	6090do
		11925do	9645do
0600	0700	Brazil, Radio Boa Vontade	6160do
		11895do	9550do
0600	0700	Brazil, Radio Cancao Nova	4825do
		9675do	6105do
0600	0700	Brazil, Radio Capixaba	4935do

0600	0700	Brazil, Radio Clube do Para	4885do	
0600	0700	Brazil, Radio Difusora de Macapa	4915do	
0600	0700	Brazil, Radio Difusora/Londrina	4815do	
0600	0700	Brazil, Radio Educadora/Limeira	2380do	
0600	0700	Brazil, Radio Globo	11805do	
0600	0700	Brazil, Radio Guaiba	6000do	
0600	0700	Brazil, Radio Guarujá Paulista	5045do	
0600	0700	Brazil, Radio Imaculada Conceicao	4754do	
0600	0700	Brazil, Radio Inconfidencia	6010do	15190do
0600	0700	Brazil, Radio Itatiaia	5970do	
0600	0700	Brazil, Radio Jornal A Critica	5055do	
0600	0700	Brazil, Radio Maria	4885do	
0600	0700	Brazil, Radio Meteorologia Paulista	4845do	
0600	0700	Brazil, Radio Mundial	3325do	
0600	0700	Brazil, Radio Nacional da Amazonia	6180do	
0600	0700	Brazil, Radio Novo Tempo	4895do	
0600	0700	Brazil, Radio Record	6150do	
0600	0700	Brazil, Radio Voz Misionaria/Camboriu	9665do	
0600	0700	Brazil, Radio Voz Misionaria/Florianopolis	11749do	
0600	0700	Brazil, Super Radio Deus e Amour/Curitiba	6060do	
0600	0700	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do	9585do
0600	0700	France, Radio France Internationale	11830sa	
0645	0700	mtwhf Portugal, RDP Internacional	11850eu	

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0745	USA, WYFR/Family Radio Worldwide	9985eu	
0700	0800	Brazil, Radio 9 de Julho	9820do	
0700	0800	Brazil, Radio A Nossa Voz	4974do	
0700	0800	Brazil, Radio Alvorada/Londrina	4865do	
0700	0800	Brazil, Radio Aparecida	5035do	6135do
		9630do	11855do	
0700	0800	Brazil, Radio Bandeirantes	6090do	9645do
		11925do		
0700	0800	Brazil, Radio Boa Vontade	6160do	9550do
		11895do		
0700	0800	Brazil, Radio Brasil 5000	4785do	
0700	0800	Brazil, Radio Brasil Central	4985do	11815do
0700	0800	Brazil, Radio Cancao Nova	4825do	6105do
		9675do		
0700	0800	Brazil, Radio Capixaba	4935do	
0700	0800	Brazil, Radio Clube do Para	4885do	
0700	0800	Brazil, Radio Congonhas	4775do	
0700	0800	Brazil, Radio Cultura/Sao Paulo	6170do	
		9615do		
0700	0800	Brazil, Radio Difusora de Macapa	4915do	
0700	0800	Brazil, Radio Difusora/Londrina	4815do	
0700	0800	Brazil, Radio Educadora/Limeira	2380do	
0700	0800	Brazil, Radio Globo	11805do	
0700	0800	Brazil, Radio Guaiba	6000do	11784do
0700	0800	Brazil, Radio Guarujá Paulista	5045do	
0700	0800	Brazil, Radio Imaculada Conceicao	4754do	
0700	0800	Brazil, Radio Inconfidencia	6010do	15190do
0700	0800	Brazil, Radio Itatiaia	5970do	
0700	0800	Brazil, Radio Jornal A Critica	5055do	
0700	0800	Brazil, Radio Maria	4885do	
0700	0800	Brazil, Radio Marumby	11724do	
0700	0800	Brazil, Radio Meteorologia Paulista	4845do	
0700	0800	Brazil, Radio Mundial	3325do	
0700	0800	Brazil, Radio Nacional da Amazonia	6180do	
0700	0800	Brazil, Radio Novas de Paz	6080do	9515do
0700	0800	Brazil, Radio Record	6150do	
0700	0800	Brazil, Radio Voz Misionaria/Camboriu	9665do	
0700	0800	Brazil, Radio Voz Misionaria/Florianopolis	11749do	
0700	0800	Brazil, Super Radio Deus e Amour/Curitiba	6060do	
0700	0800	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do	9585do
0700	0800	mtwhf Portugal, RDP Internacional	7240eu	11850eu
		15160af		
0700	0800	Sat/Sun Portugal, RDP Internacional	12020eu	15160af

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0900	Brazil, Radio 9 de Julho	9820do	
0800	0900	Brazil, Radio A Nossa Voz	4974do	
0800	0900	Brazil, Radio Alvorada/Londrina	4865do	
0800	0900	Brazil, Radio Aparecida	5035do	6135do
		9630do	11855do	
0800	0900	Brazil, Radio Bandeirantes	6090do	9645do
		11925do		
0800	0900	Brazil, Radio Boa Vontade	6160do	9550do

		11895do		
0800	0900	Brazil, Radio Brasil 5000	4785do	
0800	0900	Brazil, Radio Brasil Central	4985do	11815do
0800	0900	Brazil, Radio Cancao Nova	4825do	6105do
		9675do		
0800	0900	Brazil, Radio Capixaba	4935do	
0800	0900	Brazil, Radio Congonhas	4775do	
0800	0900	Brazil, Radio Cultura do Para	5045do	
0800	0900	Brazil, Radio Cultura/Sao Paulo	6170do	
		9615do		
0800	0900	Brazil, Radio Daqui	4915do	11830do
0800	0900	Brazil, Radio Difusora Caceres	5055do	
0800	0900	Brazil, Radio Difusora de Macapa	4915do	
0800	0900	Brazil, Radio Difusora Roraima	4875do	
0800	0900	Brazil, Radio Difusora/Londrina	4815do	
0800	0900	Brazil, Radio Educadora/Limeira	2380do	
0800	0900	Brazil, Radio Gaucha/Porto Alegre	6020do	
0800	0900	Brazil, Radio Gaucha/Rio de Janeiro	11915do	
0800	0900	Brazil, Radio Gazeta	9684do	15325do
0800	0900	Brazil, Radio Gazeta Universitaria	5955do	
0800	0900	Brazil, Radio Globo	11805do	
0800	0900	Brazil, Radio Guaiba	6000do	11784do
0800	0900	Brazil, Radio Guarujá Paulista	5045do	
0800	0900	Brazil, Radio Imaculada Conceicao	4754do	
0800	0900	Brazil, Radio Inconfidencia	6010do	15190do
0800	0900	Brazil, Radio Itatiaia	5970do	
0800	0900	Brazil, Radio Jornal A Critica	5055do	
0800	0900	Brazil, Radio Maria	4885do	
0800	0900	Brazil, Radio Marumby	11724do	
0800	0900	Brazil, Radio Meteorologia Paulista	4845do	
0800	0900	Brazil, Radio Mundial	3325do	
0800	0900	Brazil, Radio Nacional da Amazonia	6180do	
		11780do		
0800	0900	Brazil, Radio Novas de Paz	6080do	9515do
0800	0900	Brazil, Radio Novo Tempo	4895do	
0800	0900	Brazil, Radio Record	6150do	9505do
0800	0900	Brazil, Radio Rural	4765do	
0800	0900	Brazil, Radio Transmundial	5965do	
0800	0900	Brazil, Radio Voz Misionaria/Camboriu	9665do	
0800	0900	Brazil, Radio Voz Misionaria/Florianopolis	11749do	
0800	0900	Brazil, Super Radio Deus e Amour/Curitiba	6060do	11765do
0800	0900	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do	9585do
0800	0900	Portugal, RDP Internacional	12020eu	15160af
0800	0900	USA, WYFR/Family Radio Worldwide	9625sa	11770sa
0815	0900	Brazil, Radio Senado	5990do	
0830	0900	Brazil, Educadora/Braganca	4825do	
0830	0900	DRM Portugal, RDP Internacional	11995eu	

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	1000	Brazil, Educadora/Braganca	4825do	
0900	1000	Brazil, Radio 9 de Julho	9820do	
0900	1000	Brazil, Radio A Nossa Voz	4974do	
0900	1000	Brazil, Radio Alvorada/Londrina	4865do	
0900	1000	Brazil, Radio Aparecida	5035do	6135do
		9630do	11855do	
0900	1000	Brazil, Radio Bandeirantes	6090do	9645do
		11925do		
0900	1000	Brazil, Radio Boa Vontade	6160do	9550do
		11895do		
0900	1000	Brazil, Radio Brasil 5000	4785do	
0900	1000	Brazil, Radio Brasil Central	4985do	11815do
0900	1000	Brazil, Radio Cancao Nova	4825do	6105do
		9675do		
0900	1000	Brazil, Radio Capixaba	4935do	
0900	1000	Brazil, Radio Clube do Para	4885do	
0900	1000	Brazil, Radio Congonhas	4775do	
0900	1000	Brazil, Radio Cultura do Para	5045do	
0900	1000	Brazil, Radio Cultura/Sao Paulo	6170do	
		9615do		
0900	1000	Brazil, Radio Daqui	4915do	11830do
0900	1000	Brazil, Radio Difusora Acerana	4885do	
0900	1000	Brazil, Radio Difusora Caceres	5055do	
0900	1000	Brazil, Radio Difusora de Macapa	4915do	
0900	1000	Brazil, Radio Difusora Roraima	4875do	
0900	1000	Brazil, Radio Difusora/Londrina	4815do	
0900	1000	Brazil, Radio Educadora/Guajara Mirim	3375do	
0900	1000	Brazil, Radio Educadora/Limeira	2380do	
0900	1000	Brazil, Radio Gaucha/Porto Alegre	6020do	
0900	1000	Brazil, Radio Gaucha/Rio de Janeiro	11915do	
0900	1000	Brazil, Radio Gazeta	9684do	15325do
0900	1000	Brazil, Radio Gazeta Universitaria	5955do	
0900	1000	Brazil, Radio Globo	11805do	

0900 1000	Brazil, Radio Guaiba	6000do	11784do
0900 1000	Brazil, Radio Guarujá Paulista	5045do	
0900 1000	Brazil, Radio Imaculada Conceição	4754do	
0900 1000	Brazil, Radio Inconfidência	6010do	15190do
0900 1000	Brazil, Radio Itatiaia	5970do	
0900 1000	Brazil, Radio Jornal A Crítica	5055do	
0900 1000	Brazil, Radio Maria	4885do	
0900 1000	Brazil, Radio Marumby	11724do	
0900 1000	Brazil, Radio Meteorologia Paulista	4845do	
0900 1000	Brazil, Radio Missoes da Amazonia	4865do	
0900 1000	Brazil, Radio Mundial	3325do	
0900 1000	Brazil, Radio Municipal	3375do	
0900 1000	Brazil, Radio Nacional da Amazonia	6180do	11780do

0900 1000	Brazil, Radio Novas de Paz	6080do	9515do
0900 1000	Brazil, Radio Novo Tempo	4895do	
0900 1000	Brazil, Radio Record	6150do	9505do
0900 1000	Brazil, Radio Rural	4765do	
0900 1000	Brazil, Radio Senado	5990do	
0900 1000	Brazil, Radio Transmundo	5965do	11735do
0900 1000	Brazil, Radio Voz Misionaria/Camboriu	9665do	
0900 1000	Brazil, Radio Voz Misionaria/Florianopolis	11749do	
0900 1000	Brazil, Super Radio Deus e Amour/Curitiba	6060do	11765do
0900 1000	Brazil, Super Radio Deus e Amour/Sao Paulo	6120do	9585do
0900 1000	Portugal, RDP Internacional	12020eu	15160af

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana	http://rtsh.sil.at/
Angola, Angolan National Radio	www.rna.ao/
Anguilla, University Network	www.worldwideuniversitynetwork.com/
Argentina, RAE	www.radionacional.gov.ar
Australia, ABC NT Alice Springs	www.abc.net.au/radio/
Australia, ABC NT Katherine	www.abc.net.au/radio/
Australia, ABC NT Tennant Creek	www.abc.net.au/radio/
Australia, HCJB Global Australia	www.hcjb.org/
Australia, Radio Australia	www.abc.net.au/ra/
Austria, AWR Europe	www.awr2.org/
Bahrain, Radio Bahrain	www.radiobahrain.fm/
Belarus, Radio Station Belarus	www.radiobelarus.tvr.by/eng/
Belgium, TDP Radio	www.airtime.be/schedule.html
Belgium, TDP Radio/Disco Palace	www.airtime.be/schedule.html
Bhutan, Bhutan Broadcasting Service	www.bbs.com.bt
Bulgaria, Radio Bulgaria	www.bnr.bg/
Canada, Bible Voice Broadcasting	www.biblevoice.org/
Canada, CBC Northern Quebec Service	www.cbc.ca/north/
Canada, CFRX Toronto ON	www.cfrb.com
Canada, CFVP Calgary AB	www.classiccountryam1060.com
Canada, CKZN St Johns NF	www.cbc.ca/listen/index.html
Canada, CKZU Vancouver BC	www.cbc.ca/bc
Canada, Radio Canada International	www.rcinet.ca/
China, China Radio International	www.cri.cn/
China, Voice of the Strait (News Channel) Fuzhou	www.vos.com.cn
China, Voice of the Strait/Fuzhou	www.vos.com.cn
Clandestine, Sudan Radio Service/SRS	www.sudanradio.org
Cuba, Radio Havana Cuba	www.radiohc.cu/
Egypt, Radio Cairo	www.ertu.org
Equatorial Guinea, Radio Africa	www.radiopanam.com/
Equatorial Guinea, Radio Africa 2	www.radiopanam.com/
Equatorial Guinea, Radio East Africa	www.radiopanam.com/
Equatorial Guinea, Radio East Africa/Malabo	www.radiopanam.com/
Ethiopia, Radio Ethiopia	www.ertagov.com
Ethiopia, Radio Ethiopia/National Program	www.ertagov.com
France, Radio France Internationale	http://rfrfi.english.com
Germany, AWR Europe	www.awr2.org/
Germany, Deutsche Welle	www.dw-world.de/
Germany, Pan American Broadcasting	www.radiopanam.com/
Germany, TWR Europe	www.twr.org
Greece, Voice of Greece	www.voiceofgreece.gr/
Guam, AWR/KSDA	www.awr2.org/
Guam, TWR Asia/KTWR	http://nea.ktwnet.net/
India, All India Radio/Aizawl	www.allindiaradio.org/
India, All India Radio/Aligarh	www.allindiaradio.org/
India, All India Radio/Bengaluru	www.allindiaradio.org/
India, All India Radio/Bhopal	www.allindiaradio.org/
India, All India Radio/Chennai	www.allindiaradio.org/
India, All India Radio/Delhi	www.allindiaradio.org/
India, All India Radio/External Service	www.allindiaradio.org/
India, All India Radio/Gangtok	www.allindiaradio.org/
India, All India Radio/Gorakhpur	www.allindiaradio.org/
India, All India Radio/Guwahati	www.allindiaradio.org/
India, All India Radio/Hyderabad	www.allindiaradio.org/
India, All India Radio/Imphal	www.allindiaradio.org/
India, All India Radio/Itanagar	www.allindiaradio.org/
India, All India Radio/Jaipur	www.allindiaradio.org/
India, All India Radio/Jeyapore	www.allindiaradio.org/
India, All India Radio/Kolkata	www.allindiaradio.org/
India, All India Radio/Kurseong	www.allindiaradio.org/
India, All India Radio/Lucknow	www.allindiaradio.org/
India, All India Radio/Mumbai	www.allindiaradio.org/
India, All India Radio/Panaji, Goa	www.allindiaradio.org/
India, All India Radio/Port Blair	www.allindiaradio.org/

India, All India Radio/Radio Kashmir	www.allindiaradio.org/
India, All India Radio/Shillong	www.allindiaradio.org/
India, All India Radio/Shimla	www.allindiaradio.org/
India, All India Radio/Thiruvananthapuram	www.allindiaradio.org/
Indonesia, Voice of Indonesia	www.voi.co.id
Iran, IRIB/ VOIRI	www.trib.ir/English/
Italy, IRRS-Shortwave	www.nexus.org
Italy, IRRS-Shortwave/European Gospel Radio	www.egradio.org/
Japan, Radio Japan NHK World	www.nhk.or.jp/english/
Kuwait, Radio Kuwait	www.media.gov.kw/
Malaysia, RTM Kajang/Traxx FM	www.traxxfm.net/index.php
Malaysia, RTM/Voice of Malaysia	www.rtm.gov.my
Mali, ORTM/Radio Mali	www.ortm.ml
Micronesia, The Cross Radio/Pohnpei	www.pmapacific.org/
Monaco, TWR Europe	www.twr.org/
Nepal, Radio Nepal	www.radionepal.org/
Netherlands, R Netherlands Worldwide	www.radionetherlands.nl/
New Zealand, Radio NZ International	www.rnzi.com
Nigeria, Voice of Nigeria	www.voiceofnigeria.org
Oman, Radio Sultanate of Oman	www.oman-tv.gov.om
Pakistan, PBC/Radio Pakistan	www.radio.gov.pk
Palau, T8WH/ WHRI	www.whr.org/
Philippines, PBS/ Radyo Pilipinas	www.pbs.gov.ph/
Poland, Polskie Radio Warsaw	www.polskieradio.pl
Romania, Radio Romania International	www.rrr.ro/
Russia, Voice of Russia	http://english.ruvr.ru/
Saudi Arabia, BSKSA/External Service	www.saudiradio.net/
Serbia, International Radio Serbia	www.glassrbije.org
South Africa, AWR Africa	www.awr2.org/
South Africa, Channel Africa	www.channelafrica.org
South Africa, CVC 1 Africa Radio	www.1africa.tv
South Africa, RTE Radio Worldwide	www.rte.ie/radio1/
South Africa, SA Radio League	www.sarl.org.za
South Africa, TWR Africa	www.twr.org/
South Korea, KBS World Radio	www.worldkbs.co.kr
Spain, Radio Exterior de Espana	www.ree.rne.es/
Sri Lanka, SLBC	www.slbc.lk
Swaziland, TWR Africa	www.twrafrica.org
Syria, Radio Damascus	www.rtv.gov.sy/
Taiwan, Radio Taiwan International	http://english.rti.org.tw/
Thailand, Radio Thailand World Service	www.hsk9.org/
Turkey, Voice of Turkey	www.trt-world.com
Uganda, Dunamis Shortwave	www.biblevoice.org/stations/east-africa
UK, BBC World Service	www.bbc.co.uk/worldservice/
UK, FEBA Radio	www.febaradio.net
USA, American Forces Network/AFRTS	http://myafn.dodmedia.osd.mil/
USA, BBG/Voice of America	www.voanews.com/
USA, BBG/Voice of America/Special English	www.voanews.com/
USA, BBG/Voice of America/Studio 7	www.voanews.com/
USA, EWTN/WEWN Irondale, AL	www.ewtn.com/
USA, FBN/WTJC Newport NC	www.fbnradio.com/
USA, KNLS Anchor Point AK	www.knls.org/
USA, Overcomer Ministries	www.overcomerministry.org/
USA, WBCQ Monticello ME	www.wbcq.com/
USA, WHRI Cypress Creek SC	www.whr.org/
USA, WRMI Miami FL	www.wrmi.net/
USA, WRMI/Radio Slovakia Intl	www.wrmi.net/
USA, WRNO New Orleans LA	www.wrno.com
USA, WTTW Lebanon TN	www.wttw.us/
USA, WWCN Nashville TN	www.wvcn.com
USA, WWRB Manchester TN	www.wwrb.org/
USA, WYFR/Family Radio Worldwide	www.familyradio.com/
Vatican City State, Vatican Radio	www.vaticanradio.org/
Vietnam, Voice of Vietnam/Overseas Service	www.vov.org.vn
Zambia, CVC Radio Christian Voice	www.voiceafrica.net
Zambia, ZNBC/Radio Two	www.znbc.co.zm

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Navy Training Wing Update

In our July 2010 *Milcom* column, we presented a profile for two of the U.S. Navy Aviation Training Air Wings – TAW-5 and TAW-6. Since that report we have uncovered some major changes to the frequencies used by Training Air Wing (TAW) Five.

Training Air Wing Five is located five miles north of Milton, Florida, on board Naval Air Station Whiting Field. The wing is comprised of three primary fixed-wing and three advanced helicopter squadrons and it trains aviators from the Navy, Marine Corps, Coast Guard, Air Force, and allied nations.

This wing is responsible for an estimated 43 percent of the Chief of Naval Air Training Command's total flight time and over 11 percent of Navy and Marine Corps' flight time world-wide. Over 1,200 personnel complete their essential flight training here annually.

Here is the latest information on callsigns and frequencies used by TAW-5.

Squadron Call Signs

Within Local Area		Beyond Local Area	
Unit	Tactical Callsign	Phonetic ID	ICAO Callsign
VT 2	Black Bird	BB	Navy 2 Echo ###
VT 3	Red Knight	RN	Navy 3 Echo ###
VT 6	Shooter	SH	Navy 6 Echo ###
FITU/TW5	Spiral (T-34)	SP	Navy 5 Echo ###
T-6	Texan (T-6)	TX	Navy 5 Echo ###

All student solo aircraft use the word "solo" at the end of their call signs. T-6 aircraft are identified during the filing of their IFR flight plan by the prefix TEXNXXX on either military or civilian flight plans. Initial radio calls will include "Texan" and the aircraft side number.

As the TAW-5 squadrons complete their aircraft transition from T-34s to T-6s, the squadron

call sign plus a unique flight identifier number will be assigned by the squadron and used in place of the normal side number.

Training Wing 5 Common Use Frequencies

Frequency	Facility (Airfield ID)
118.800/251.100	Mobile Downtown Tower (KBFM)
119.550/317.750	Andalusia-Opp (South Alabama Regional) Tower (79J)
119.900/257.800	Pensacola Regional Tower (KPNS)
120.700/340.200	NAS Pensacola Tower "Sherman Tower" (KNPA)
121.250	Pensacola Regional ATIS (KPNS)
121.400/306.925	NAS North Whiting Field Tower
121.400/348.675	NAS South Whiting Field Tower UHF Channel 19
121.700/336.400	NAS Pensacola Ground Control (KNPA)
121.900/273.450	Andalusia-Opp (South Alabama Regional) Ground Control (79J)
121.900/348.600	Pensacola Regional Ground Control (KPNS)
121.950	TAW-5 Instructor Common
122.800	Atmore (Airfield is Emergency use only) CTA/Unicom (OR1) and Bay Minette CTA/Unicom (1R8)
122.950	Mobile Downtown Air Center (KBFM) and Pensacola Aviation Center (PNS) (KPNS)
123.000	Florida CTA/Unicom (0J4) and Monroeville CTA/Unicom (KMVC)
123.725/256.875	Pensacola Regional Clearance Delivery (KPNS)
124.050/393.000	Eglin Approach (Crestview RI Advisory Area)
124.350/266.800	NAS Pensacola ATIS (KNPA)
126.500/351.675	Hurlburt Field Tower (KHRT)
133.200/290.425	Duke Field Tower (KEGI)
133.450	Andalusia-Opp (South Alabama Regional) Approach Control (79J)
134.100/268.700	NAS Pensacola Clearance Delivery (KNPA)
134.150/338.300	Jacksonville Center PNS Sector UHF (handles North MOA)
134.875	Andalusia-Opp ASOS (79J)
143.000	Hurlburt Field Command Post (KHRT)
225.750	Duke Field 919th Command Post (KEGI)
233.700	NAS Whiting Base Operations/Operations Duty Officer (ODO)
237.900	Harold NOLF Crash
250.000	Pace NOLF Crash
251.125	Duke Field Ground Control (KEGI)
251.150	NAS North Whiting Field Ground Control
251.250	Hurlburt Field Command Post (KHRT)
251.300	Site 8 NOLF Crash
253.100	TAW-5 HITU
254.350	Evergreen Radio UHF Channel 14
254.900	TAW-5 UHF Channel 12
255.100	HT-18 Field Duty Officer (FDO)
257.975	Brewton Radio UHF Channel 13
266.800	NAS Pensacola ATIS (KNPA)
269.425	Barin Field Radio UHF Channel 9
273.575	NAS South Whiting Field ATIS
273.750	TAW-5 FITU – Spiral Base
274.700	Night Common/RI Common (Saufley, Monroeville, Whiting, Brooklyn, Gateswood) UHF Channel 18
275.800	Hurlburt Field Ground Control (KHRT)
299.500	TAW-5 UHF Channel 16
303.150	TAW-5 Area Common
303.600	HT-8 Field Duty Officer (FDO)
307.375	RI Common (Crestview)

309.800	Pensacola South MOA Common "Gator Common" (PNSS)
312.100	NAS Pensacola Operations Duty Officer (ODO) (KNPA)
316.950	Whiting Metro
335.450	Hurlburt Field Metro (KHRT)
336.400	NAS Pensacola Ground (KNPA)
340.100	Contract Maintenance (KNSE)
341.850	TAW-5 Formation Common (UHF Channel 15)
342.200	Duke Field/Eglin AF Aux Nr 3 (KEGI) – Eglin Metro Remote
342.800	VT-3 – Red Knight Base
346.800	NAS South Whiting Field Ground Control UHF Channel 20
350.150	VT-2 – Blackbird Base
355.550	VT-6 – Shooter Base
355.600	NAS South Whiting Field Clearance Delivery
358.800	Spencer NOLF Crash
359.600	NAS Pensacola Metro (KNPA)
360.675	Hurlburt Field ATIS (KHRT)
361.100	Santa Rosa NOLF Crash
361.900	Santa Rosa NOLF Crash
371.900	Pensacola North MOA Common (monitored by Jacksonville Center) (PNSN)
380.800	Choctaw Radio/Tower UHF Channel 17

Training Wing 5 Fixed-Wing Aircraft UHF Radio Presets

Channel	UHF Freq	Facility
1	290.325	North Whiting ATIS
2	257.775	North Whiting Clearance
3	251.150	North Whiting Ground
4	306.925	North Whiting Tower
5	278.800	Pensacola Departure
6	291.625	Pensacola Approach (North)
7	269.375	Pensacola Approach (South)
8	303.150	Area 1 Common
9	269.425	Barin
10	345.200	Silverhill
11	340.200	Sherman Tower
12	254.900	Area 2T
13	257.975	Brewton
14	254.350	Evergreen
15	341.850	Area 2F
16	299.500	Area 3
17	380.800	Choctaw
18	274.700	RI/Night Common
19	348.675	South Whiting Tower
20	346.800	South Whiting Ground

✦ Milair Frequency Updates

Major changes to the 225-400 MHz military UHF aircraft band continue to be announced by the U.S. military and the federal government. Here are the latest official frequency additions, updates and changes directly from the Federal Aviation Administration (FAA).

118.250/269.450	Harrisburg PA Approach/Departure Control
118.625	Michigan City Muni IN Clearance Delivery (KMGC) (ex-134.800)
	South Bend Regional IN Clearance Delivery (KSBN)



USN T-34 CONA Paint Scheme Aircraft Whiting Field

119.050/269.500	Los Angeles ARTCC — Low Altitude Discrete (Sector 15), San Luis Obispo CA RCAG (ZLA)	134.400/317.425	Jacksonville ARTCC — Approach/Departure Service, Gainesville FL RCAG (ZJX) (ex-385.600)
119.300/307.100	Honolulu ARTCC — Low/High Altitude Discrete (Sector 4), Waimanalo HI and Mount Haleakala RCAGs (ZHN)	134.575/354.100	Los Angeles ARTCC — Low Altitude Discrete (Sector 22), Santa Catalina CA RCAG (ZLA)
119.525/259.300	Valdosta GA Approach/Departure Control	134.650/360.650	Los Angeles ARTCC — Low Altitude Discrete (Sector 7), Nelson NV RCAG (ZLA)
119.650	Allentown PA Approach/Departure Control (ex-118.200)	135.500/327.100	Los Angeles ARTCC — Low Altitude Discrete (Sector 14), Santa Barbara CA RCAG (ZLA)
119.700/269.000	Anchorage ARTCC — Low/High Altitude, Kenai AK RCAG (ZAN)	254.275	Chicago ARTCC — Hampshire IL RCAG (ZAU)
119.800	Muskegon MI Approach/Departure Control	255.800	Lincoln Muni NE — National Guard Operations (KLNK)
119.900/306.900	Honolulu ARTCC — Low/High Altitude Discrete (Sector 6), Kokee HI RCAG (ZHN)	257.725	Altus AFB OK Approach/Departure Control
121.025	Lambert St. Louis International MO — Approach Control (KSTL)	257.800	Palm Beach International Tower (KPBI)
123.750/256.800	Fort Leonard Woods — Waynesville-St. Robert Regional (Forney Field) MO Ground Control (KTBN)	270.800	Pensacola FL Approach/Departure Control (ex-376.800)
123.800/353.800	Oakland ARTCC — Low Altitude Discrete (Sector 16), Fresno CA RCAG (ZOA)	273.600	Sarasota/Bradenton International Tower/Ground Control (KSRQ) (ex-269.700)
124.100/273.525	Harrisburg PA Approach/Departure Control	284.600	Palm Beach International Ground Control (KPNI) (ex-257.800)
124.100/317.500	Honolulu ARTCC — Low/High Altitude Discrete (Sector 3), Mount Haleakala HI RCAG (ZHN)	291.775	Decatur Airport IL Tower/Ground Control (KDEC) (ex-392.100)
124.200/343.600	Los Angeles ARTCC — Low Altitude Discrete, Cedar City UT RCAG (ZLA)	308.600	Wichita Falls TX Approach/Departure Control
124.400	McCarren International NV Ramp Control (Gates A/B/C) (KLAS)	316.075	Wichita Falls TX Approach/Departure Control
124.450	Allentown PA Approach/Departure Control	317.400	Palm Beach FL Approach/Departure Control (ex-387.100)
124.625/377.100	Los Angeles ARTCC — Low/High Altitude Discrete (Sector 16), Keeler CA, Mount Potosi NV and Tonopah NV RCAGs (ZLA)	342.300	R-5601 Falcon Range Control OK Secondary (ex-385.900)
124.850/319.200	Los Angeles ARTCC — Low Altitude Discrete, Seligman AZ RCAG (ZLA)	343.600	Palm Beach FL Approach/Departure Control
125.275/351.700	Los Angeles ARTCC — Low Altitude Discrete, Pleasant Peak CA RCAG (ZLA)	346.600	Fort Richardson (Anchorage)/Bryant AAF Metro (KFRN) (ex-344.600)
125.375/254.325	Jacksonville ARTCC — Low Altitude, Lake City FL RCAG (ZJX)	353.825	Salt Lake City UT Departure Control (ex-387.000)
125.800/351.800	Los Angeles ARTCC — Low Altitude Discrete (Sector 13), Saddle Peak CA RCAG (ZLA)	363.700	R-5601 Falcon Range Control OK Primary (ex-390.100)
126.150	Springfield IL Approach/Departure Control	377.150	Chicago O'Hare International IL Approach Control
126.350/290.200	Los Angeles ARTCC — Low Altitude Discrete (Sector 20), Riverside CA RCAG (ZLA)	381.300	Moody AFB GA AFSOC Command Post Alternate (KVAD) "Angel Ops" (ex-381.050)
126.450/281.525	Harrisburg PA Approach/Departure Control		
126.500/269.400	Honolulu ARTCC — Low/High Altitude Discrete (Sector 2), Mauna Kapu HI and Mount Kaala RCAGs (ZHN)		
126.600/285.600	Valdosta GA Approach/Departure Control		
126.600/284.600	Honolulu ARTCC — Low/High Altitude Discrete (Sector 7), Hamakua HI RCAG (ZHN)		
126.850/322.500	Oakland ARTCC — Low Altitude Discrete (Sector 23), Angels Camp CA RCAG (ZOA)		
127.100/317.700	Los Angeles ARTCC — Low Altitude Discrete (Sector 3), Bakesfield CA RCAG (ZLA)		
127.300	Fort Leonard Woods — Waynesville-St. Robert Regional (Forney Field) MO "Forney Ops" (KTBN)		
127.475/291.700	Kansas City ARTCC — Low Altitude, Marion MO RCAG (ZKC) (ex-346.275)		
127.500/239.275	Detroit MI Departure Control (Palace 5)		
127.800/353.500	Oakland ARTCC — Low Altitude Discrete (Sector 40), Mount Tamalpais CA and Ukiah CA RCAGs (ZOA)		
127.900	McCarren International NV Ramp Control (Gate D/Cargo Ramp) (KLAS)		
127.925	Moody AFB GA Basic Radar — Approach/Departure Control Service (KVAD)		
128.600/291.700	Los Angeles ARTCC — Low Altitude Discrete (Sector 9), Mount Laguna CA RCAG (ZLA)		
128.700/307.000	Oakland ARTCC — Low Altitude Discrete (Sector 10), Priest CA RCAG (ZLA)		
128.800/285.500	Oakland ARTCC — Low Altitude Discrete (Sector 45), Fallon NV RCAG (ZOA)		
132.500/284.700	Los Angeles ARTCC — Low Altitude Discrete (Sector 17), Bastow CA RCAG (ZLA)		
132.575	Springfield IL Approach/Departure Control (ex-118.600)		
132.850/323.125	Potomac TRACON VA — Approach/Departure Control		
133.600/269.250	Salt Lake City ARTCC — Low Altitude, Bryce Canyon UT RCAG (ZLC)		
133.825	Salt Lake City ARTCC — Low Altitude, Hanksville UT RCAG (ZLC)		
	Muskegon MI Approach/Departure Control		

❖ New Pacific Metro Frequency

I have well documented in this column that the former nationwide DoD Metro frequency 344.600 MHz is being cleaned out to make way for a new wideband signal subband. It now appears that at least a few of the bases in the Pacific that used this former Metro frequency have moved to a new frequency — 346.600 MHz.

The following bases have now been documented using this new frequency: Eielson AFB AK; Elmendorf AFB AK; Fort Richardson/Bryant AHP AK; Andersen AFB Guam; Joint Base Pearl Harbor-Hickam, with remote briefing service to Bradshaw AAF and Wheeler AAF all in Hawaii.

The bases listed below are still being shown with 344.600 MHz assignments on various online sources. If you are near one of these bases and have recently observed their Metro frequency in use, we could use an update. Please contact us at the email address in the masthead.

McClellan Airfield CA (KMCC); Cape Canaveral AFS FL (KXMR); MacDill AFB FL (KMCF); NASA



U.S. Coast Guard HC-144 aircraft (photo courtesy of the US Coast Guard)

Shuttle Landing Facility FL (KTTS); Patrick AFB FL (KCOF); MCAS Kaneohe Bay HI (PHNG); Grissom ARB IN (KGUS); Andrews AFB MD (KADW); Whiteman AFB MO (KSZL); MCALF Bogue Field NC (KNJM); Pope AFB NC (KPOB); Wright Patterson AFB OH (KFFP); Willow Grove NAS/JRB PA (KNXX); Kingsville NAS TX (KNQI); and Orange Grove NALF TX (KNOG).

❖ CanForce HF NAWS Mode Change

As of June 1 of this year, the Canadian Forces HF station CFH located at Halifax, Nova Scotia, is now using the STANAG 4285/75L/3300 + ITA2/5N1 framing mode instead of their former FSK baudot transmissions for Notice to Allied Warships (NAWS) broadcast transmissions. Shortly after the June 1 changeover, the following Stanag 4285 marker was observed on 5095.2 10493.2 15918.2 kHz (all former FSK frequencies):

NAWS DE CFH ZKR F1 2822 3394 4158 6242 8324 12371 AR

I have also observed CFH using Stanag 4285 sending encrypted traffic on 8542.0 8697.0 12726.0 kHz.

And, in the "Guess I somehow missed this announcement department," according to John Snyder on the Ocean Navigator Online website, CFH Halifax, the Canadian Forces Metoc (Meteorology and Oceanography), ceased high frequency weather and fax broadcasts on Sept. 2, 2010.

According to Senior Staff Officer Lt. Darryl Williams, "Canadian naval vessels are no longer using it because they receive weather information by other means. There are no plans to re-instate the HF weather and fax broadcast unless required for urgent military operational needs. The Canadian Coast Guard publication Radio Aids to Marine Navigation has been updated to reflect the status of the Canadian Forces Fleet Weather Broadcast."

Frequencies used by this former HF service included: 122.5 4271.0 6496.4 10536.0 13510.0 kHz.

❖ Coast Guard Air Miami Bids Farewell to the Jet Age

Coast Guard personnel celebrated the HU-25 Falcon jet's 29 years of service as the last two jets departed the station on their final Coast Guard missions to Cape Cod, Massachusetts, and Elizabeth City, North Carolina, back in June of this year.

During the 29-years at Air Station Miami, the HU-25 Falcon jets accrued more than 150,000 flight hours, prosecuted 4,000 search-and-rescue cases, 5,000 law enforcement cases which resulted in 3,000 lives saved or assisted, the interdiction of 20,000 undocumented migrants, and the seizure of 30,000 pounds of illegal drugs.

The HU-25 Falcon jets are being replaced by the HC-144 Ocean Sentry aircraft.

And that does it for this month. Until next time, 73 and good hunting.



Clear-Channel Stations to Return

DXers were surprised last year when two major 50,000-watt AM stations in Montreal went silent. We were even more surprised when the owners, rather than selling the stations, surrendered their licenses for cancellation.

Metromedia CMR Broadcasting, the firm that owned CINF-690 and CINW-940, has applied to have those licenses reinstated. They have an agreement with Transport Quebec to operate the stations to carry traffic reports. As during their lives as CINF and CINW – and as CBC outlets CBF and CBM before that – the 690 frequency will broadcast in French; 940 in English.

These will be 50,000-watt non-directional stations, using the same transmitters and antennas they used as CINF and CINW. They will be heard across most of the eastern part of the continent, and should be DXable in many places in the West. DXers should probably pay more attention to landing whatever other signals they can hear on these channels, before the two big Montreal signals come back. You'll have to try quickly: 690 & 940 expect to return to the air "this fall."

Some stations to try for on 690 include WIST New Orleans; KGGF Coffeyville, Kansas; KOAQ Terrytown, Nebraska; CBU Vancouver; and CBKF-1 Gravelbourg, Saskatchewan. The latter station broadcasts in French. I've not been nearly so lucky on 940, but there are stations here in Fort Atkinson, Wis. (WFAW); Des Moines (KPSZ); and again, New Orleans. (WYLD).

DXers have been asking, why use these monster 50,000-watt stations for traffic information? In the U.S., many communities use one or more low-powered transmitters, often in the expanded band above 1600 kHz. Powers are on the order of 25 watts. A series of 25-watt trans-

mitters would seem to be a lot more economical than a pair of 50,000-watt outlets.

One advantage of using the 690/940 transmitters in Montreal is simply that they already exist! There's no need to build dozens of transmission sites across the city. Further, the 690/940 pair will require only one program feed per language, to the single transmitter. Low-powered transmitter networks require a feed to each transmitter. These links are not exactly cheap! And then there's maintenance – does an engineer visit a single site, or does he have to spend his time touring the city, inspecting dozens of locations?

Would it even be possible for a chain of low-powered transmitters to provide the coverage required? The U.S. systems generally only cover the major highways. A commuter living 5 miles from the Interstate may not know about the construction backup until it's too late to take an alternate route. The 50,000-watt transmitters will cover the entire Montreal metropolitan area, even those zones far from the nearest major highway.

It should be noted that expanded-band frequencies are not available for travelers' information stations in Montreal. (And, remember that two frequencies are required for this service, one English and one French.) Montreal is the only city with three existing expanded-band stations: CJWI-1610, CJRS-1650, and CJLO-1690. Frequencies in the "regular" band are available, but are of course subject to considerable interference.

❖ IBOC Interference: Good for DXers?

DXers in parts of the East and Midwest have enjoyed the ability to receive CBC programming on CBE-1550, Windsor. This station has permission to move to 97.5 FM; when it does so, there will be no high-powered CBC AM transmitters left between Winnipeg and Cape Breton Island. The FM transmitter is now on the air; the license called for AM 1550 to be silenced by the end of March. That deadline has been extended to the end of September.

Quoting Bev Kirshenblatt, CBC's Senior Director, Regulatory Affairs, in a letter to the Canadian Radio-television and Telecommunications Commission (CRTC): "...our new FM frequency CBEW-FM Windsor on 97.5MHz is experiencing interference from HD

Radio carriers from US stations that operate at 97.1 MHz and 97.9 MHz respectively. "... "The interference area is in downtown Windsor and we estimate the zone of interference impacts between 20,000-40,000 people ..." Windsor is located directly across the Detroit River from Detroit, Michigan, where WXYT-FM occupies 97.1 and WJLB 97.9.

A report has been filed with Industry Canada, which will coordinate a response to the issue with the FCC. Kirshenblatt expects a resolution by the end of September. What that resolution will be is hard to guess. There has been some talk of the use of asymmetrical IBOC sidebands – maybe WXYT could drop their upper IBOC sideband and WJLB their lower digital sideband, eliminating the interference. This will be interesting to watch, as there are other places along the border where IBOC issues are likely.

In any case, delays in the resolution of this FM interference problem are giving us a few more months to land an AM DX catch!

❖ Scorecard

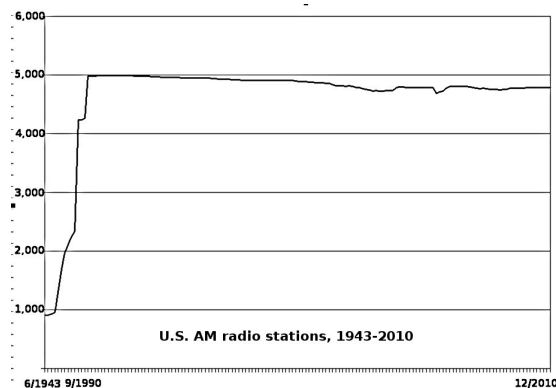
Here in the U.S., the FCC releases a quarterly report listing the total number of broadcast stations in each category. One must suspect this report is not a very high priority, when the totals for the end of March are released in mid-May. But it can be interesting reading anyway.

As of the end of March, there were 4,778 AM stations authorized. That's down four – about 0.083% – from the end of 2010. Commercial FM stations are up slightly, with 6,533 authorized, an increase of seven.

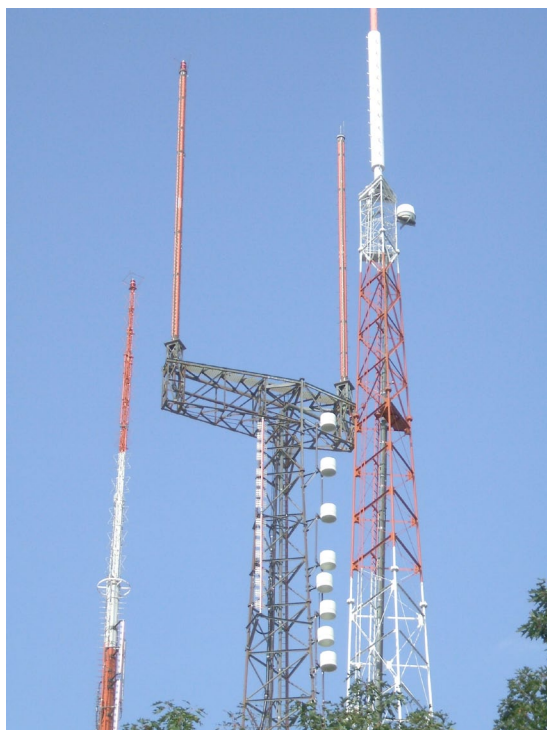
One of the deleted AM stations was WVUV-648 at Leone, American Samoa. The 648 kHz frequency is not a typo. Stations in the Western Hemisphere operate on 10 kHz channels – 630, 640, 650, 660, etc.. Those in the Eastern Hemisphere are on 9 kHz channels – 630, 639, 648, 657, etc.

The big change is in non-commercial FM facilities. There are 3,417 of these authorized. Nearly 3% of these – 106 stations – were first authorized in the first three months of 2011. The FCC is continuing to work their way through a huge stack of pending applications. We should expect to see another large increase in non-commercial FM next quarter. Most of these stations are religious in nature, although public broadcasters and community stations (like the KZGM mentioned last time) are also receiving new permits. There remain 859 low-power FM stations, unchanged.

There's also been an increase in the number



The decline – and leveling off – of AM radio in the U.S.



These three towers in Rochester, NY host a variety of FM and TV antennas.

of FM translators, from 6,131 to 6,141. There are hundreds of applications pending for these stations as well. The Commission has had some trouble deciding what to do about them.

There's not much change among full-sized TV stations. Eight VHF commercial stations disappeared – I suspect they were all stations in isolated parts of the West which were authorized to broadcast but were never built. The UHF commercial total remains steady at 1,022, as does the total for non-commercial VHF's, at 107. Montana State University was granted one new non-commercial UHF station, on channel 46 at Kalispell.

Washington has also been busy canceling defunct TV translators and low-power stations. Roughly 1% of the 3,073 UHF translators have been deleted, along with about 3% of the 1,454 VHF translators. LPTV stations (516 VHF, 1,656 UHF) and Class A stations (76 VHF, 439 UHF) are also down slightly.

The total: as of the end of March, there are 30,643 broadcast stations in the U.S..

❖ "New" AM station in Nashville

Last time I mentioned a Nashville HD2 subchannel showing up in the ratings, by way of an analog translator. Now, there's another analog signal relaying this HD subchannel, and this time it's AM. WQZQ Goodlettsville, Tennessee is now on the air, on 830 with 2,000 watts daytime only. WQZQ was on 1550 from Clarksville, about 40 miles away. The Clarksville facility was destroyed in the big flood of 2010; in any case, plans had already been laid (and approved by the FCC) for the Goodlettsville move.

WQZQ-830 is using one of the WPLN-1430 towers north of Nashville. Again, the format is gospel music. This station should be quite DXable

at sunrise and sunset; however, to my knowledge Steve Francis in Knoxville is the only DXer to report this station. (Besides myself, that is, but at 20 miles from my location WQZQ is hardly DX!)

❖ Digital TV DX

Analog TV was supposed to go off the air in Canada at the end of this month. However, the Canadian Radio-Television and Telecommunications Commission (CRTC) has given analog a reprieve. Only stations in "mandatory markets" will be required to convert. Other stations may continue to operate in analog indefinitely – as long as they operate below channel 52. Stations above 51 must either move to a lower channel or go dark.

DXers have been cleaning up on Canadian analog stations this spring. With the interference from U.S. ch. 2-6 analogs gone, there's not much in the way of foreign reception. Many of these will continue to be available after the September 1st partial changeover. Some of the more widely-seen Canadian analogs that will continue include CHBX-TV (2) Sault Ste. Marie; CITO-TV (3) Timmins; CJOH-TV-6 (6) Deseronto; and CKND-TV-2 (2) Minnedosa.

On the other hand, some of the more widely-seen stations are in mandatory markets and will convert. Such stations include CBWFT (3) Winnipeg (and their English counterpart CBWT (6)); CIII-TV-6 (6) Ottawa; CKPR-TV (2) Thunder Bay; and CKVR-TV (3) Barrie. CIII and CKPR will, however, be "flash-cutting" on their existing channels, leaving us with an opportunity for Canadian digital skip DX.

❖ Mailbag

Last time, I asked whether you listen to the radio using something other than a radio. Craig Campbell N0GTI wrote from Illinois to report listening on five (yes, five!) free-to-air satellite dishes. Craig receives more than 250 free TV channels and over 100 free radio channels. He notes that broadband Internet is very expensive in his rural location. Craig uses the LyngSat.com website to locate free-to-air satellite broadcasts. I also make extensive use of this site at work, for information on not-so-free channels, and find the site very useful.

John Schmelzer wrote from St. Louis with a few notes about interesting programming on distant stations. I mentioned DX on 1660; John finds that frequency home to what he considers the most interesting AM station: KXTR Kansas City. John believes that since WQXR-1560 New York switched to Radio Disney, KXTR is the only AM station left broadcasting classical music.

Certainly, music of all kinds is disappearing from AM; indeed, classical music is also vanishing rapidly from FM as public radio stations find spoken-word programming more popular. One might have expected the classics to have disappeared from AM decades ago.

But, in fact, KXTR is not the only AM station left broadcasting classical music. WCCC-1290 Hartford, Connecticut is also playing the classics on AM. As a 490-watt station (dropping to eleven

watts at night), WCCC would be an excellent DX catch pretty much anywhere outside the Nutmeg State.

John also notes occasional daytime DX, from late November through the end of February. Around 2:00 o'clock, one December afternoon, a Fargo, North Dakota station faded in at his location. The program: a call-in show reminiscing about northwest Minnesota dumps and incinerators!

❖ 'Til Next Month

What have you heard on 690 and/or 940 with the big Montreal signals gone? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to dougsmith@monitoringtimes.com. Good DX!

URLS IN THIS MONTH'S COLUMN

<http://americanbandscan.blogspot.com> - My DX blog
www.radiobach.com/ - AM 1660 Kansas City, a rare AM classical music station
www.lyngsat.com/ - LyngSat, a useful reference for satellite transponders
www.mtg.gov.gc.ca/portal/page/portal/A392CF51648F0334E04400144F0104BD - Transports Quebec press release announcing new all-traffic radio in Montreal
<https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?AppNo=201100883> - CBC request citing U.S. IBPC as grounds for delaying an AM-to-FM shift

BROADCAST STATION REPORT

NEW

Permits granted for new stations:

Craig, Colorado	1450
	250/250 ND
Osceola, Indiana	1210
2,500/219 DA-2 (near Elkhart)	
Rowe, New Mexico	1420
2,500/103 ND (25mi. SE of Santa Fe)	

Applications for new stations dismissed:

Halifax, Virginia	1600
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Applications for new stations:

Montreal, Quebec	690
50,000/50,000 ND	
Montreal, Quebec	940
50,000/50,000 ND	
Montreal, Quebec	1530
unknown	

CHANGES

Frequency & location changes on the air:

Goodlettsville, Tennessee	830	WQZQ
2,000 daytime only; from 1550 in Clarksville		

Frequency & location changes granted:

Soda Springs, Idaho	800	K B R V
from 790; 10,000/150 ND		

Stations deleted:

Leone, American Samoa	648	WVUV
Pine Bluff, Arkansas	1400	KCLA
Pine Bluff, Arkansas	1490	KOTN
Cleveland, Mississippi	1410	WDSK
Winona, Mississippi	1570	WONA
Gaffney, South Carolina	1180	WFGN
Tyler, Texas	690	KZEY

ND: non-directional

DA-N: directional at night only

DA-D: directional during daytime only

DA-2: directional all hours, two different patterns

DA-3: directional day, night and critical hours, three different patterns



Aero Frequencies

Various types of aero voice communications serving different functions are in the air, just waiting to be heard. The VHF aero band runs from 118.0 to 137.0 MHz in 25 kHz steps.

Most scanners receive this band plus the aeronautical radionavigation band from 108.0 to 117.975 MHz. Some folks are surprised to learn that the latter band can include some voice transmissions as well.

Each frequency is intended for a specific use and these are spelled out in "47 C.F.R. Part 87 – Aviation Services."

To help you better enjoy the hobby, let's try to make some sense of this!

❖ Airport Frequencies

Airports with control towers use several frequencies. Non-towered airports often have just one or two. Go to www.airnav.com/airports/ and use the search box to find an airport. Then, scroll down to "Airport Communications." Most of the following will be listed for commercial airports.

Clearance Delivery is where you will hear flight plan details being read to pilots of IFR (Instrument Flight Rules) flights prior to taxi. Included in the exchange is the particular departure frequency that will be used, should you wish to follow the flight. The Clearance Delivery function sometimes occurs on the Ground Control frequency or is simulcast with Ground Control. During periods of low activity, Clearance Delivery, Ground Control, and Tower may all be simulcast. It works best to have them all programmed in for a given airport where you are able to hear the ground side.

Clearance Delivery example: Controller – *Horizon four zero five, Capitol Ground, cleared to San Jose Airport via heading one six five vectors Sacramento VOR, direct Modesto VOR to join the Modesto two one six radial, Lake intersection direct, maintain seven thousand, expect nine thousand five minutes after departure, departure frequency one two five point two five, Squawk four five zero one.*

At this point the pilot reads back the entire clearance and then the controller says – *Four zero five, readback correct.*

Ground Control is a position in the tower cab charged with controlling aircraft on the taxiways and in ramp / parking areas. A large metro-area airport may also have **Ramp Control** or **Gate Control** frequencies in addition to Ground Control.

To fully understand and take advantage of the runway, taxiway, and parking instructions, you need to refer to the airport diagram for the

airport of interest. They are available via <http://AirNav.com>. Once at the desired airport page, look on the right. Under the thumbnail of the airport diagram is "Download PDF." It can be useful to print it out for reference.

Ground Control frequencies are typically in the 121.6 to 121.925 MHz range. If a given GC frequency is 121.7, for example, the handoff may be called out as *contact Ground point seven* with 121 being understood. A departing aircraft is handed off by Ground to the Tower when it taxis to near or reaches the end of the runway.

Here is an example of an airliner making a taxi request: *Airliner – Capitol Ground, Southwest seven thirty-four, taxi. Controller – Southwest seven thirty-four, Runway One Six Left, taxi via Yankee Two, Yankee, Delta. Airliner – Yankee Two, Yankee, Delta, One Six Left, Southwest seven thirty-four.*

Arriving airliner example, upon exiting Runway 16L: *Airliner – Southwest two forty-three, clearing Delta Nine. Controller – Southwest two forty-three, Capitol Ground, taxi to the ramp via Delta, Charlie Two. Airliner – Delta, Charlie Two, to the ramp, Southwest two forty-three.*

If you download the airport diagram for SMF, you will see where he exited Runway 16L, then turned a hard right onto taxiway D, then to C3, and left into the parking area.

The **Tower** controls aircraft in the air in the immediate airport area and on the runways. Many but not all Tower frequencies are found in the 118.0 to 121.975 MHz range. Planes that have lifted off are handed off from the Tower to Departure Control. Arriving planes are handed off from Approach Control to the Tower.

Just handed off from NorCal Approach, destination Sacramento International Airport: *Pilot – Capitol Tower, Southwest ten thirty-three, right downwind for One Six Left. Controller – Southwest ten thirty-three, Capitol Tower, Runway One Six Left, cleared to land. Pilot – One Six Left, cleared to land, Southwest ten thirty-three.*

On Tower frequency, ready to depart: *Controller – Southwest five twenty-nine, Capitol Tower, maintain four thousand, Runway One Six Left, cleared for takeoff. Pilot – One Six Left, up to four thousand, Southwest five twenty-nine.*

ATIS – Most of the larger airports have ATIS (Automatic Traffic Information Service) transmissions. They are prerecorded, periodically updated broadcasts that cycle over and over. Each version is identified by a phonetic alphabet letter. If a version is identified as *Information Charlie*, the next updated version will be *Information Delta*, etc. The purpose of ATIS is to facilitate pilot acquisition of needed information from the broadcast, which relieves the controller from continually repeating it and occupying an ATC frequency.

Here is an ATIS example from Sacramento International Airport (SMF): *Sacramento Inter-*

national Airport Information Echo at one niner five three Zulu, wind calm, visibility one zero, sky clear below one two thousand, temperature two three, due point six, altimeter two niner niner four, simultaneous visual approaches in use, land runway one six right and left, Clearance Delivery is on 121.7, metering in effect for San Francisco International Airport, Los Angeles International Airport, use caution for bird activity and crop dusters in vicinity of the airport. Advise on initial contact you have Information Echo.

ASOS / AWOS – These (ASOS - Automated Surface Observing System, and AWOS - Automated Weather Observing System) are automatic, continuously updated weather broadcasts which contain information derived from a variety of sensors. ASOS and AWOS are similar. If you wish to explore the differences, Google ASOS vs. AWOS. Some airports have neither and some have one or the other.

Here is an example of AWOS from Nevada County Airport (GOO): *Nevada County Airport Automated Weather Observation, two one five three Zulu, Wind – two seven zero at four knots, Peak Gusts – one four knots, Visibility – more than ten, Sky Conditions – clear below one two thousand feet, Temperature – one seven Celsius, Due Point – four Celsius, Altimeter – two niner niner four inches of mercury. Note that the decimal in the spoken altimeter reading is always omitted – and 29.94 with it.*

If you live in or near a metro area, search or tune through the VHF aircraft band with your scanner connected to a good outside antenna. You should hear several ASOS and/or AWOS broadcasts (ATIS as well).

UNICOM – Airports with a full time control tower or full-time Flight Service Station (FSS) use 122.95 MHz strictly for non-ATC communications, and it can be interesting to monitor at times. Unlike UNICOM frequencies at non-towered airports, 122.95 isn't used for airport advisories / pilot-to-pilot communications. Its use is similar to airliners, charters, and BizJets on ASRI (Aviation Spectrum Resources, Inc.) / FBO (Fixed base Operator) frequencies in the range of 128.825 to 132.0 and 136.5 to 136.975 MHz to state arrival times and request or inquire about fuel, repairs, various types of service, ground transportation, accommodations for passengers, etc.

UNICOM Frequencies at non-towered airports – Pilots at these airports announce their intentions prior to taxiing and departure, when arriving in the airport area, and as they progress through the various legs of the landing pattern. Pilots talk with each other and work out any coordination.

The UNICOM operator, when present, at a non-towered airport may provide wind speed and direction, altimeter setting, runway condition, fuel availability, transportation / food / lodging info,

etc., but no air traffic control.

A portion of small airports are quite busy and can be worth a listen. Some are home for things like forestry, law enforcement, medical transport, experimental aircraft, skydiving, and other users. You won't know until you listen.

Generally, non-towered airports have a UNICOM frequency licensed to them and it will be one of these: 122.7, 122.725, 122.8, 122.975, 123.0, 123.05 or 123.075 MHz.

❖ TRACON Frequencies

When you look up airport frequencies at <http://AirNav.com>, you will often see several Approach and Departure frequencies listed for an airport. These are not airport frequencies but instead TRACON (Terminal Radar Approach Control) frequencies. TRACON facilities are not necessarily located at airports.

Not long after an airliner or other IFR flight departs from the runway, the Tower controller will say "Contact Departure." The pilot uses the departure frequency given to him/her during the Clearance Delivery phase.

If the flight is going some distance, the TRACON controller will transition the flight through one or more sectors while it climbs to cruise altitude and the "enroute phase" – most always above 18,000 feet. It will, at some point, be handed off to the appropriate ARTCC (Air Route Traffic Control Center) sector controller. Such handoffs are usually pretty quick. NorCal TRACON Controller – *Zero one quebec, contact Oakland Center one three two point two. Pilot - One three two point two, zero one quebec, good day.*

The reverse is true when an IFR flight needs to descend from cruise altitude and ARTCC control and be transitioned through one or more TRACON sectors / controllers to near the approach end of the runway. At this point, a TRACON Approach controller will hand off the flight to the airport Tower.

Approach controller – *Mesaba thirty fifty-seven, Sacramento International Airport ten o'clock fifteen miles. Pilot – Sac, thirty fifty-seven. Controller – Mesaba thirty fifty-seven, cleared visual approach Runway One Six Left. Pilot – Visual One Six Left, Mesaba thirty fifty-seven. A minute or so later, Controller – Mesaba thirty fifty-seven, contact Capitol Tower one two five point seven. Pilot – One two five point seven, thirty fifty-seven, see ya.*

Short flights can originate and terminate all within the control area of a single TRACON. The ARTCC doesn't become involved with such flights.

Parts of the country away from the larger commercial airports may have no TRACON facilities. In such cases, the ARTCC for that area may provide that function by way of unmanned RCAG (Remote Communications Air/Ground) facilities. Such an AirNav.com listing would look something like this: *APCH/DEP SERVICE PROVIDED BY OAKLAND ARTCC FREQ 127.8/353.5 (MOUNT TAMALPAIS RCAG).*

TRACON controllers will give frequent traffic alerts. Here is an example: Controller – *Three Niner Victor Charlie, eleven o'clock and seven miles southwestbound regional jet one*

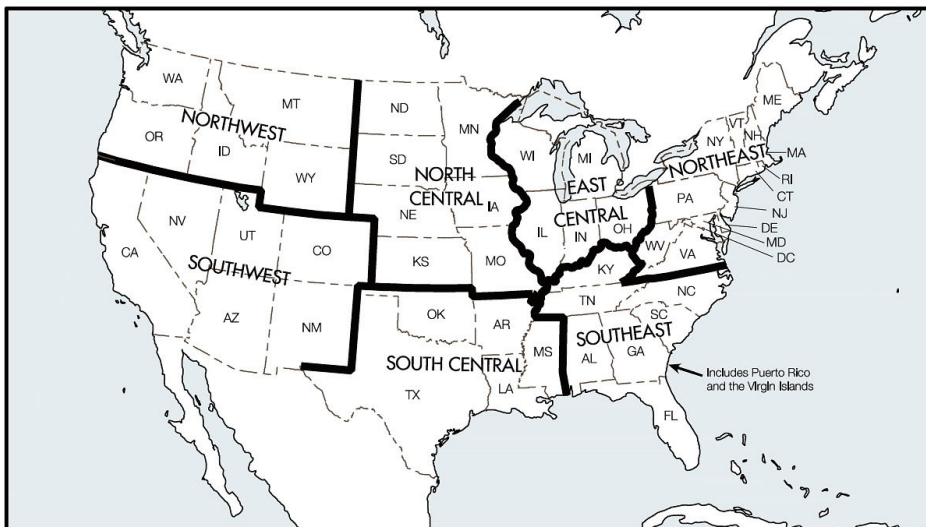


Airport control towers serve as the nerve center for aircraft movement at or near the airport.

zero thousand five hundred descending through eight thousand. Pilot – Three Niner Victor looking, no contact, will advise. Controller – Three Niner Victor, Roger.

❖ ARTCC Frequencies

Like TRACONs, ARTCCs have multiple sectors (irregular chunks of three-dimensional airspace fitted together), some low altitude, some high altitude, and each with its own controller and a simulcast VHF/UHF frequency pair. The UHF side (225 to 380 MHz) is for military aircraft, though some mil aircraft will communicate on VHF.



The Airport/Facility Directory volumes are a source of U.S. airport and supplemental information.

The entire country is overlain by ARTCCs; Google *ARTCC map*. TRACON airspace is always beneath ARTCC airspace. You can gather ARTCC frequencies for your listening radius by writing down the handoff frequencies you hear and/or you can refer to references. See *A/FD* below and try Googling *ARTCC frequencies*.

❖ Airport/Facility Directory

The *A/FD* (*Airport/Facility Directory*) is a mixed bag. It does, by way of its seven paper or digital volumes, have official frequency and other info for all public U.S. airports, but AirNav is much easier to use, contains more info, and offers more value to hobby listeners. On the other hand, the paper *A/FD* is easy to thumb through and can serve as a convenient portable reference.

The back section of each *A/FD* volume contains some interesting information on a variety of subjects. It is a pain to get there, but this is how you do it (and along the way you may find other interesting things to explore). Go to www.faa.gov/air_traffic/flight_info/aeronav/ and click on "Free Digital Products." When that comes up and under "Applications," click on "*digital - Airport/Facility Directory (d - A/FD)*." If two dates are shown, click on the one showing the newer date. When that is up, click on a state of interest. Select an airport. Click on "Search."

To view the airport information on the selected airport, look under "Airport/NAVAID Results" and then under "PDF File," click on "View." You will see why AirNav.com is the winner over the *A/FD*, but, importantly, on the same page as the "View" link is a "Supplemental" link. This leads to a PDF download of 200+ pages that includes ARTCC VHF frequencies for the states covered by the particular *A/FD* volume.

Printed *A/FD* volumes may be found by Googling *airport facility directory purchase*.

Once again, I have run out of space. See you next time!



Sunshine Radio: Hot Florida Action

Sandy beaches, year-round mild temperatures and a mouse with a high-pitched voice: There are many reasons people flock to the state of Florida for recreation or permanent relocation. That creates a huge diversity of listening opportunities for those who know where to look.

Between theme parks, space exploration, and significant weather events, Florida has something for just about every type of communications hobbyist. Here at the height of hurricane season is a perfect time to tune in the sounds of the Sunshine State.

Given the size of Florida, it can be a bit overwhelming to try to organize a listening strategy. Therefore, I am going to break the state down into five key areas: Panhandle (Northwest), Jacksonville (Northeast), Tampa (West), Orlando (Central) and Miami (South).

In addition to highlighting where to find scanner and other communications, I will include a few of the major radio stations in each area; these are great choices when breaking news occurs in that part of the state. This list is by no means complete, but it should be a good starting point for tuning in communications from Florida, especially if tropical weather is heading its way.

❖ Panhandle (Northwest)

This region includes the state capital, Tallahassee, as well as popular tourist destinations such as Destin, Panama City, and Pensacola.

With the Gulf Coast experiencing a large share of hurricane landfalls, this area is one that bears watching over the next couple of months for storm-related communications. In addition, there are several military bases and many popular beaches that can provide interesting listening opportunities.

Broadcast Radio Stations

WYOO 101.1FM - Panama City, FL - www.talkradio101.com/index.shtml
WCOA 1370AM - Pensacola, FL - www.wcoapensacola.com/
WNWF 1120AM - Destin, FL - www.destin1120am.com/
WFLA - 100.7FM - Tallahassee, FL - www.wfla.com/main.html
SouthWest Florida Local News (Internet Only) - Tallahassee, FL - www.southwestfloridalocalnews.com/

NOAA Weather Radio

NOAA Weather RadioKEC86 - Pensacola, FL - <http://tunein.com/radio/NOAA-Weather-Radio-1624-s88211/>

Scanners

Escambia County - www.radioreference.com/apps/audio/?ctid=332
Santa Rosa County - www.radioreference.com/apps/audio/?ctid=372
Okaloosa County - www.radioreference.com/apps/audio/?ctid=361

Holmes County - www.radioreference.com/apps/audio/?ctid=345
Jackson County - www.radioreference.com/apps/audio/?ctid=347
Liberty County - www.radioreference.com/apps/audio/?ctid=354
Gadsden County - www.radioreference.com/apps/audio/?ctid=335
Leon County - www.radioreference.com/apps/audio/?ctid=352
Wakulla County - www.radioreference.com/apps/audio/?ctid=380
Jefferson County - www.radioreference.com/apps/audio/?ctid=348

❖ Jacksonville (Northeast)

This region incorporates much of the "first coast" area, including St. Augustine. For the purposes of this column, we will consider this region as stretching down to Cape Canaveral and Daytona along the Atlantic coast.

In addition to communications from the city of Jacksonville, there are several airports, NASA communications, major sporting events in Jacksonville, Gainesville and Daytona, and miles of beaches. All of this gives listeners a large number of opportunities for interesting listening.



Broadcast Radio Stations

WMMV 1350AM - Cocoa Beach, FL - www.wmmbam.com/main.html
WIXC 1060AM - Titusville, FL - www.wixc1060.com/
WNDB 1150AM - Daytona Beach, FL - <http://daytonasun.com/News.html>
WNZF 1550AM - Bunnell, FL - <http://wnzf.com/>
WSKY 97.3FM - Micanopy, FL - www.thesky973.com/
WCOA 96.7FM - Ocala, FL - <http://thesource1370.com/>
WBOB 600AM - Jacksonville, FL - www.600wbob.com/
WOKV 690AM - Jacksonville, FL - www.wokv.com/
WFQY 1240AM - St. Augustine, FL - www.1240news.com/

Online Receivers

GlobalTuners Online Receiver (Registration required) - Vero Beach - www.globaltuners.com/receiver/109/

Airport Communications

Jacksonville International Airport - www.liveatc.net/search/?icao=jax
Daytona Beach International Airport - www.liveatc.net/search/?icao=dab
Gainesville Regional Airport - www.liveatc.net/search/?icao=gnv
Melbourne International Airport - www.liveatc.net/search/?icao=mlb

NOAA Weather Radio

NOAA Weather Radio WXJ70 - <http://tunein.com/radio/NOAA-Weather-Radio-16255-s88214/>
NOAA Weather Radio KHB39 - <http://tunein.com/radio/NOAA-Weather-Radio-16255-s88213/>

Scanners

Brevard County (includes a link for NASA communications) - www.radioreference.com/apps/audio/?ctid=320
Jacksonville Fire/Rescue - <http://tunein.com/radio/Jacksonville--FireRescue-s139102/>
Volusia County - www.radioreference.com/apps/audio/?ctid=379
Flagler County - www.radioreference.com/apps/audio/?ctid=333
Putnam County - www.radioreference.com/apps/audio/?ctid=369
Alachua County - www.radioreference.com/apps/audio/?ctid=316
St. Johns County - www.radioreference.com/apps/audio/?ctid=370
Duval County - www.radioreference.com/apps/audio/?ctid=331

❖ Tampa (West)

This area incorporates the Tampa/St. Petersburg metro area, Clearwater and all the way down to Naples in the Southwest part of the state. Most of the major communications here will come from Tampa, with normal city communications, major sporting events and marine communications.



Broadcast Radio Stations

WFLA 970AM - Tampa, FL - www.970wfla.com/main.html
WWBA 820AM - Largo, FL - <http://820wwba.com/>
WGUF 98.9FM - Naples, FL - www.wguf989.com/
WINK 1200AM - Pine Island Center, FL - www.winknewsradio.com/
WENG 1530AM - Englewood, FL - www.wengradio.com/

NOAA Weather Radio

NOAA Weather Radio KHB32 - Tampa, FL - <http://tunein.com/radio/NOAA-Weather-Radio-16255-s89370/>
NOAA Weather Radio WXX83 - Fort Myers, FL - <http://tunein.com/radio/NOAA-Weather-Radio-162475-s88209/>

Airport Communications

Southwest Florida International Airport - Ft. Myers, FL - www.liveatc.net/search/?icao=rsf
Tampa International Airport - Tampa, FL - www.liveatc.net/search/?icao=tpa
St. Petersburg - Clearwater International Airport - St. Petersburg, FL - www.liveatc.net/search/?icao=pie
Charlotte County Airport - Punta Gorda, FL - www.liveatc.net/search/?icao=pgd

Scanners

Pasco County - www.radioreference.com/apps/audio/?ctid=366
Hillsborough County - www.radioreference.com/apps/audio/?ctid=344
Pinellas County - www.radioreference.com/apps/audio/?ctid=367
Manatee County - www.radioreference.com/apps/audio/?ctid=356
Sarasota County - www.radioreference.com/apps/audio/?ctid=373
Charlotte County - www.radioreference.com/apps/audio/?ctid=323
Lee County - www.radioreference.com/apps/audio/?ctid=351
Collier County - www.radioreference.com/apps/audio/?ctid=326

❖ Orlando (Central)

The landlocked portion of the state houses some of the most unique communications in the state. The major theme parks, such as Disney World and Universal, are tantalizing choices for those wanting to hear "behind the scenes." Not only do the parks have their normal operating communications, but special events such as parades and shows give lucky listeners a front-row seat to the action that few have had the privilege of hearing before.

Online Receivers (Use the frequency list below to find local frequencies of interest for Walt Disney World communications)
W4GPL - <http://www.dxzone.com/cgi-bin/dir/jump2.cgi?ID=19678>

Broadcast Radio Stations

WFLF 540AM - Pine Hills, FL - www.540wfla.com/main.html
WDBO 580AM - Orlando, FL - www.wdbo.com/
WORL 660AM - Orlando, FL - www.660worl.com/
WDYZ 990AM - <http://radio.disney.go.com/music/yourstation/orlando/index.html>
Walt Disney World Radio (Internet Only) - www.wdwradio.com/

NOAA Weather Radio

KIH63 - Orlando - <http://tunein.com/radio/NOAA-Weather-Radio-162475-s88210/>
Airport Communications
Orlando International Airport - www.liveatc.net/search/?icao=mco
Orlando Sanford International Airport - www.liveatc.net/search/?icao=sfb

Scanners

City of Orlando Fire - <http://tunein.com/radio/City-of-Orlando-FD-s139213/>
Orange County Fire/Rescue - <http://tunein.com/radio/Orange-County-Fire-Rescue-s139092/>
Orange County - www.radioreference.com/apps/audio/?ctid=363
Osceola County - www.radioreference.com/apps/audio/?ctid=364
Polk County - www.radioreference.com/apps/audio/?ctid=368
Lake County - www.radioreference.com/apps/audio/?ctid=350

❖ Miami (South)

From West Palm Beach all the way to the Keys, this portion of the state is both the most densely populated and the most active for radio communications. A major source of the action comes from DEA and other law enforcement efforts to stop drugs from entering into the United States; Miami is a popular choice for entry.



Broadcast Radio Stations

WIOD 1610AM - Miami, FL - www.610wiod.com/main.html
WFTL 850AM - West Palm Beach, FL - www.850wftl.com/
WJNO 1290AM - West Palm Beach, FL - www.wjno.com/main.html
WDJA 1420AM - Delray, FL - www.jammin1420.com/

NOAA Weather Radio

NOAA Weather Radio KHB34 - Miami, FL - <http://tunein.com/radio/NOAA-Weather-Radio-16255-s88206/>
NOAA Weather Radio KEC50 - West Palm Beach - <http://tunein.com/radio/NOAA-Weather-Radio-162475-s88207/>

Airport Communications

Ft. Lauderdale / Hollywood International Airport - www.liveatc.net/search/?icao=fll
Miami International Airport - www.liveatc.net/search/?icao=mia
Palm Beach International Airport - www.liveatc.net/search/?icao=pbi

Scanners

Key West Public Safety - <http://tunein.com/radio/Botes-Wild-Feed-s128008/>
Coral Springs Police - <http://tunein.com/radio/Coral-Springs-Police-Scanner-s18459/>
Plantation Police Dispatch - <http://tunein.com/radio/Plantation-Police-Dispatch-s133757/>
Palm Beach County - www.radioreference.com/apps/audio/?ctid=365
Broward County - www.radioreference.com/apps/audio/?ctid=321
Dade County - www.radioreference.com/apps/audio/?ctid=328
Monroe County - www.radioreference.com/apps/audio/?ctid=359

Each area of Florida has its own attraction. If you like fast-paced public safety communications, start with Miami and then try Tampa or Orlando. If you are looking for marine communications, the Tampa/St. Pete area is a good start, with Jacksonville and the "First Coast" also yielding good results.

Miami has the busiest airport in the state, and Miami Center provides some excellent air communications. Public safety communications

from Orlando during sporting events or special events at one of the theme parks should be interesting.

Of course, if a hurricane or other severe weather outbreak occurs, a combination of NOAA Weather Radio from the affected area, local news/talk radio stations, and public safety communications should provide you with the complete picture of what is actually happening on the ground.

This list should give you a good start to finding what you are looking for. The vast difference in culture and geography from the Northwest area along the Gulf Coast, down to the Southern tip and the Keys area, guarantees there is something for just about everyone to enjoy hearing online from the Sunshine state.

❖ A smartphone isn't a scanner, right?

Scanner enthusiasts have for years found state and local scanner laws to often be more than a little frustrating. Some have even found themselves the unlucky recipient of a fine or worse for mobile scanner use.

But that smartphone scanner app you just downloaded for your iPhone or Droid-based phone won't land you in hot water, will it?

Turns out, it could.

Law enforcement in scanner restricted areas are looking at scanner apps as if they were scanners themselves. A would-be robber in Indiana received misdemeanor charges after police found out he was using his scanner app on his cellphone to find out when police were closing in on his location.

People who live in states like Indiana, Florida and New York, where there are laws on the books concerning mobile use of scanners, might want to be careful about how and where they use their scanner apps.

It is a good idea for any scanner enthusiast to check into their state and local laws regarding scanner use, specifically mobile scanner use. If your area has laws concerning mobile scanner use, you may want to take the same precautions with your scanner apps that you would with an actual scanner.

Whether any charges regarding scanner app use would hold up in court remains to be seen. In the Indiana case, the misdemeanor charges were dropped. However, if this becomes a bigger issue, especially if more criminals use apps to aid in their activity, we could see a backlash against scanner apps as well.

❖ Is a Smartphone the new Walkman?

Don't let the above story scare you away from streaming audio apps on your smartphone. As a matter of fact, a study by Jacobs Media shows that people are using their smartphones more than ever for Internet radio listening.

But what does that mean for terrestrial radio? Fortunately for broadcasters, 20 percent of those who listen to Internet Radio still listen to at least four hours a day of broadcast AM/FM radio.

What can we glean from this study? People

want media, and they want it to go with them no matter where they are. If they are in the car, at home, at work, in the park, by the pool or on the bus, they want to bring their media with them.

On a recent beach trip, I found myself using my Pandora app on my iPhone to listen to '80s music while enjoying the sun. I then turned on the NOAA Weather Radio stream for that area to find out what the weather was going to look like that day. I still listened to local radio while in the car driving, but no matter where I was, I was bringing my media experience with me.

So, maybe the smartphone is the new Walkman. At least my smartphone won't eat my cassette tapes like my Walkman used to do!

GLOBALNET LINKS

OnTheRadio.net: Destin/Ft. Walton Beach Radio Stations - www.ontheradio.net/cities/destin_fl.aspx

Hidden Mickey's Walt Disney World Frequencies - www.hiddenmickeys.org/WDW/WDW_Freqs.html

Police Scanner Apps Could Get You Arrested - <http://phandroid.com/2011/05/25/warning-police-scanner-apps-can-you-lead-you-to-serve-hard-time/>

Police apps not 10-4 - http://technolog.msnbc.msn.com/_news/2011/05/23/6704362-police-on-radio-scanner-apps-thats-not-a-10-4

45% Of Internet Radio users do it on a smartphone - <http://satelliteradioplayground.com/2011/06/10/45-of-internet-radio-listeners-do-it-on-a-smartphone-study/>



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BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY

kevincarey@monitoringtimes.com

Information for Free

Today, it's hard for me to imagine how we ever got along without the Internet. I can't remember the last time I wrote a column that *didn't* include some mention of a website or e-mail address. This month, we'll explore some of the websites that I use on a regular basis for LF information. The web can be a goldmine of data, helping you to get much more out of your radio hobby. It also helps level the playing field with the transmitting side of our hobby (Ham radio) by allowing listeners to "talk back" with other listeners in near real-time fashion. Gone are the days of thinking the web would replace our radio hobby: It has only enhanced it!

Do you recall when you first got online? I remember hearing about the Internet in the late 1980s when it was still run by the Department of Defense. Later, I heard that some companies and large universities had access to it, but it remained largely a mystery to me, and I certainly did not grasp the role it would later play later in the radio hobby. Sometime about 1994 I finally got an e-mail account at work, followed closely by web access, and I haven't looked back since. I continue to be amazed at the information and resources I find online to improve my experience in the radio hobby.

❖ Not Online?

I want to say a quick word to our readers who are not online. Be assured that we will not leave you hanging at *Below 500 kHz*! I understand that some folks have little or no interest in computers, or do not have the ability to get online for one reason or another. While we do make frequent use of web resources and e-mail, we will always welcome your traditional postal mail, and respect the fact that not everyone is online. Our main focus here will remain on radio.

However, if you have the slightest interest in exploring the Internet, I would ask you to try one thing... Take this issue of *MT* to your local library, where you can get online for free, and try visiting a few of the websites listed below in bold letters. If you're a complete novice with computers, don't worry. Library staff will be glad to assist you, and show you how to enter the website addresses.

Who knows, you might discover a new horizon once you're there, and if you don't like it, at least you can say that you gave the Internet a try! It's really much easier than you think. My father-in-law is 84 years old, and you should have seen him light up when I brought up some

websites related to WWII aircraft – one of his favorite pastimes. He ended up showing *me* some of the features on the planes we saw on screen!

❖ Longwave Websites

Listed below, in no particular order, are many of my favorite sites related to the longwave hobby. Any list like this is subject to change as soon as it is printed. If you find that a link returns an error message, try entering some key words from the descriptions into your search engine. You may be able to find the site (or similar ones) in that way.

www.lwca.org/

The Longwave Club of America (LWCA) Home Page. If I could only pick a handful of sites to have in my "favorites" list, this would certainly be one of them. This site is maintained by John H. Davis, one of the columnists of the LWCA's monthly journal, the *Lowdown*. Here, you will find links to reference data, a message board for posting questions and comments, and information on joining the LWCA.

www.ve3gop.com/

Alex Wiecek's website has an emphasis on Canadian Longwave stations. Alex maintains several aviation beacons in Ontario as a career, and he brings a unique perspective to longwave monitoring. Be sure to check his online database of Canadian stations from 10 to 530 kHz, NDB photos, and his WWSU logging software, which you can download here.

www.g0akn.aerthgroup.org.uk/page10.html

Dedicated to John Taylor, G0AKN, and his VLF Earth Current Experiments. This site ties in well with our past discussions about "Through-Ground Radio." You'll be amazed at the ranges achieved by transmitting through the Earth with VLF signals.

www.angelfire.com/space/proto57/rdf.html

This is a site devoted to self-contained Radio Direction Finding (RDF) receivers that were once common on mid-sized boats before the advent of GPS. Nearly all of these operated on LF and MF frequencies, and they can make great DXing receivers today.

www.radiosky.com/

Resources for Amateur Radio Astronomers, Teachers and Students. If natural radio is your thing, be sure to check out this site.

www.auroralchorus.com/

Famed site by Stephen P. McGreevy for learning about all aspects of natural radio reception and recording. The VLF Story here is "must read" for anyone interested in the subject of whistlers, twinks, dawn chorus, and the like.

www.lfengineering.com/

Website of the LF Engineering Company of

East Haven, CT, longtime manufacturers of Low Frequency Equipment for LF Communications, Natural Radio Research, AM Broadcast, Marine and Shortwave Radio.

http://500kc.com/

Home Page of the 500 KC Amateur Radio Experimental Group. This group operates under special FCC authority just above 500 kHz. Their work has been very successful, and may lead to a ham allocation in the vicinity of 500 kHz in the future. The website gives details of the experiment, and provides a way for you to report any stations you hear.

www.stormwise.com/

Stormwise Lightning Detectors, Ferrite Rods, variable capacitors, and VLF Radio Equipment. Stormwise also has a line of LF antennas for listening, as well as plans for building radio projects, including a Whistler Receiver (see bottom of webpage).

www.alexander.n.se/

This website is home to a museum in Grimeton, Sweden which exhibits and operates the last working Alexanderson Alternator in the world. This unique transmitter uses no tubes or semiconductors, but operates by spinning an alternator at low RF frequencies (around 17 kHz). Click the British flag to view the site in English.

http://worldaerodata.com/

Website of the World Aeronautical Database. Here, you can look up almost any beacon or Navaid in the world. Very complete. Easy to use.

www.airnav.com/

AirNav provides free detailed aeronautical information on airports and navigation aids, and is completely searchable. Note: Does not include 2-letter "compass locator" beacons.

www.w3eee.com/

W3EEE Longwave website by Stephen Dove, featuring his unique *Grabulator* online receiver, which you can monitor. The receiver is located in Mt. Gretna, PA.

www.hermanboel.eu/radiohistory/index.htm

European LW/MW Broadcast History. Want to see what the LF broadcasting scene looked like in Europe from 1925 on? This is the place to find out.

www.w8ji.com/ndb beacon fish buoy net beacons.htm

Good overview on beacon transmitters, fish net beacons and causes of NDB harmonics and keying problems. (Note: The spaces in this web address are intentional.-k.c.)

www.dxinfocentre.com/ndb.htm

Bill Hepburn's very comprehensive list of LF/MF aeronautical & marine beacon stations.

www.loran-history.info/

In February, most LORAN navigation stations (100 kHz) ceased operations. Still, there is a fascinating history behind the development of these stations. This ground-based system got

In the mood for a project? This site describes a Shielded Loop for LF work that could be just the ticket to high performance, low noise reception of beacons and other longwave signals. This is the antenna we built over several issues of *MT* last year.



RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ

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Power for the BC-1206-C

First let me mention how much I appreciated all the comments I received regarding the “high police band mystery” that came up in connection with the Philco 37-62 that was our last restoration project. Two of them were quoted in the last issue, and since then I’ve received two more thoughtful analyses. These came from Michael Allen (Fort Benton, MT) and Francis Wehner (Groton, CT). Thank you both for weighing in on this subject!

❖ Last Month’s Progress

Last month we introduced a new restoration project: The BC-1206 beacon receiver. This diminutive (4” x 4” x 6 5/8”) 200-400 kHz World War II era receiver is interesting both electrically and historically. An interesting electrical feature is that not only the tube heaters but also the plates and screens operate from a single 24-28 V d.c. supply. There are no dynamotors, vibrators, or other means to generate high voltage. The historical interest arises from the fact that, though it could be installed in a standard instrument panel opening, this radio was especially intended for a quick and easy temporary installation.

Why would such a feature be needed? Well, receivers in this frequency band were required to pick up weather and other information broadcast by airports, not to mention homing beacons that facilitated landing under conditions of limited visibility. But these were essentially domestic services not normally needed by fighter planes operating in war theaters – thus such receivers were generally not included in the normal radio equipment package.

Yet the ability to receive informational transmissions and beacons was important to pilots ferrying planes from the factories where they were built to their points of embarkation to war zones. Hence the need for the little 1206-C. As mentioned last month, these pilots were quite often women from an organization known as WASP (Woman Airforce Service Pilots). These women handled ferrying and other non-combat assignments to free up male pilots for battle.

Besides reviewing the radio’s history, we discussed the circuitry and (with some difficulty) pried the set from its cabinet so we could take a look inside. There was the expected complement of paper capacitors of the type I would normally replace on sight. However, since most of them were rated at 250 volts or more and there was no voltage higher than 24 or so to be found in the set, I thought it would be safe to leave the original caps in place.

So, all that there was left to do was arrange

for 24-28 volts d.c. at three-quarters of an ampere to power the radio. Back when I was in high school large amounts of surplus radio equipment were flooding the market, and a good friend whose interest in aviation was as intense as mine in electronics picked up a 1206-C. He was anxious for me to get it running for him but I was totally stumped by the power requirements.

There was no way, with the financial means and technical expertise of an average high school kid, that I could figure out how to generate that voltage and current using the technology of the time. Now, however, a quick shopping trip to Radio Shack supplemented by various items from the junk box netted me what I would need for under \$25.00.

❖ The Remarkable LM-317

The power supply was built around the LM-317 3-terminal voltage regulator. This remarkable and inexpensive unit (\$2.69 at Radio Shack) has been around for many more years than I know (for starters, it appears in a mid 1980s Radio shack databook that I own). Looking at a schematic diagram of the innards of this postage-stamp sized beastie, one is amazed by all of the active elements crammed into it – I suppose by some photographic process.

But, complex as it might be inside, the device is incredibly simple to use. Its pinout includes only three terminals – input, output and adjust. Add a couple of resistors and a couple of capacitors (see Fig. 1), and you have a circuit capable of delivering a regulated d.c. voltage of any value up to 37 volts at 1.5 smps (depending on input voltage and resistor values selected). Substitute a rheostat-connected potentiometer for one of the resistors and you have a continuously variable power supply delivering from a few volts up to the maximum.

You’ll find a little calculator at www.lm-317-circuits.com/calculator.html that will compute the voltage output of the LM-317, up to the max of 37, for various resistor sizes. However, for every voltage output expected, the input voltage must be at least 2.5-volts higher.

To supply the d.c. input voltage to my regulator circuit, I purchased a 25.2V @ 2A transformer from Radio Shack (at \$12.99, it was my largest purchase for this project). This I would pair up with a 4A bridge rectifier from the junkbox, connecting a 1000 uF 50-volt smoothing capacitor across the resulting d.c. output as recommended in the regulator manufacturer’s application notes. This output would be fed to the regulator circuit between the input terminal and ground.

❖ Heatsinking

Normally, when I need to put together a special circuit for an MT project, I’ll build it breadboard style – especially if the device is being constructed for demonstration purposes only and I don’t intend to keep it. In this case, I would be building a continuously adjustable 0-24 volt (or so) 1-1/2 ampere d.c. supply that might very useful for other projects in the future. I already had on hand a perfect aluminum box to build it in. So I decided to take the extra time required.

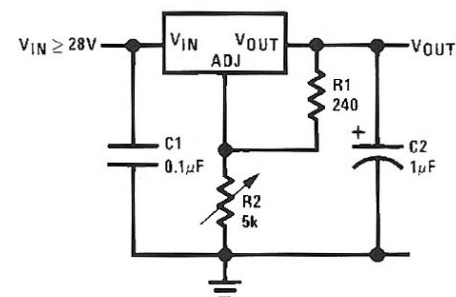
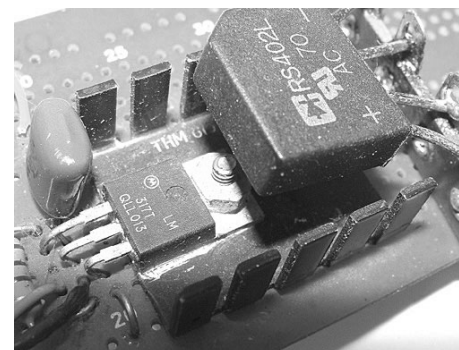


Fig. 1. Typical LM-317 regulator circuit from manufacturer’s data sheet.

One of the first issues that had to be settled before construction could begin was the mounting of the LM-317. The literature warned that it had to be properly heatsinked if it was to provide its rated 1-1/2 ampere output. But what constitutes a proper heat sink? One might think that mounting it directly to the aluminum box would do the trick.



To save space, large bridge rectifier unit (right) overhangs part of LM-317 heatsink.

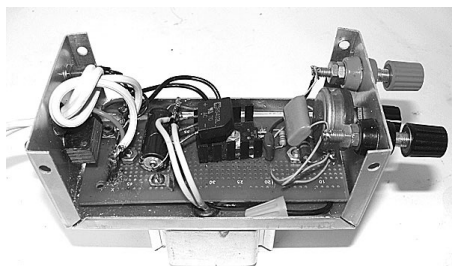
But there’s a complication. The metal mounting tab of the LM-317 is connected to its output pin. If it’s not appropriate for that pin

to be connected to the metal box, an insulated mounting kit has to be used. It includes a mica separator that goes between device and box and a fiber insulating washer for the mounting screw. Is a 317 thus mounted properly heatsinked? Probably, but I don't know.

Other heatsink choices were a little clip that could be slid over the device if it was to be mounted free-standing and a finned plate intended to be mounted under the device using a hole that lines up with the hole in the mounting tab. I chose the latter.

❖ Construction

The rectifier and regulator circuits were built up on a scrap of perforated board that was to be mounted inside the box using the same screws used to fasten the transformer on top. Since the parts were installed on the non-foil side of the board, I didn't have to worry about insulating under the heat sink. My junk box yielded most of the hardware I would need, including binding posts, a potentiometer for voltage control, a line cord and grommet, a resistor and the few capacitors.



A look inside the completed power supply.

However, before building the circuit into the box, I tack-soldered the transformer, potentiometer, etc. to the completed board for testing. Powering it up with a meter across the regulator output, I could see a voltage indication. But I was puzzled by the uneven response shown on the meter as I rotated the potentiometer through its range. Finally it struck me. I was using an audio taper potentiometer and I needed a linear taper unit.

I didn't have a linear pot of the 5k value needed for my desired voltage output. But I did have a 10k unit. So I paralleled a 10k fixed resistor across the half of the potentiometer I was using as a rheostat (I needed for the resistance to go up – thus increasing voltage output, as the control was turned clockwise.). The result, a linear transition from 0 to 5 k as the control was rotated matched by a linear increase in voltage throughout the control range.

Now I was ready to mount the parts in the box – which *definitely* took a lot longer than the breadboard construction I was used to!

I was very happy that I had recently added a Harbor Freight drill press to my bench top because there were a lot of holes to be carefully placed and drilled! But eventually the job was done and I was ready for the smoke test.

I first powered up the circuit without a load, observing about 23 volts at the output binding posts. Since about 32 volts were being delivered

to the input of the LM-317 and the rated voltage drop across the device was just a couple or three volts, I had the potential of getting about 29 volts out of the supply.

But to do that, I would have to get a potentiometer with slightly larger maximum resistance. That was fine in theory, but awkward to arrange in practice. So, since the BC-1206 input was rated at 24-28 volts (at 0.75 amperes), I decided that I would be happy with the 23 volts. Now I was ready to smoke test the radio.

❖ Testing the BC-1206

With the radio still out of the cabinet, I clip-leaded its power input connections to the power supply output. The audio output of the radio was headphone level with the output transformer strapped for 300 ohms. This could be changed to 4,000 ohms by moving an internal connection, but I had a set of 600-ohm phones, so I left it alone. Besides plugging in the phones I had only to hook up my short basement antenna and turn on the set.



The BC 1206 hooked up to power and ready for testing.

With the power supply turned on and the set turned off, I was reading the expected 23 volts. Now I was curious to see how turning on the set would affect the reading. Clicking on the power switch, I went through a moment of discouragement as the voltage dropped precipitously to a much lower value. But apparently the regulating circuits within the LM-317 needed only a moment to do their magic because the voltage quickly rose again, stopping at exactly 23.

What did I hear in the phones, you ask? Well, the results were disappointing but expected. As the radio warmed up, I began to hear a loud raspy noise in the phones, but no stations were heard at any position on the dial. I haven't listened a lot at these frequencies, but I've been led to expect poor signals during the summer months as well as a lot of trash from such things as lamp dimmers, power company digital control codes and what not.

I'm pretty sure that the radio is working, since I hear static when running a screwdriver across the antenna terminal, and placing my finger on the terminal makes the raspy signals much louder. This last observation certainly suggests that those signals are being picked up over the air and not generated by the power supply or within the receiver.

Next time we'll touch up the alignment of the receiver and then set it up with an outside antenna to see what we might hear. I'm also planning to try listening late at night or in the very early a.m. when static due to lighting and various human activities might be at a minimum. See you then!

❖ The AWA Gateway

When I'm wearing my *Monitoring Times* columnist's hat, I don't usually switch to my Antique Wireless Association publication editor's hat, but forgive my making a short temporary exchange so that I can tell you about a new AWA electronic mini magazine. Called *The AWA Gateway*, it is a sister to our long-time print publication *The AWA Journal*. Both are quarterlies and they are published alternately. While only AWA members receive a subscription to the Journal – paid for with part of their membership fee, the Gateway is free to all and available at our web site: www.antiquewireless.org.

The content of *The AWA Gateway* has been kept at a very basic level with the intent of stimulating and encouraging interest in the antique radio hobby. But the publication is not exactly "Antique Radio for Dummies." Rather, it seeks to provide a broad overview for the sophisticated reader who is looking for a grounding in antique radio lore. Take a look and tell me what you think.

Care to make suggestions for improvement? Perhaps you'd like to contribute pictures and descriptions of your collections, projects and activities? I look forward to hearing from you.

❖ Coming Soon: the Annual AWA Convention

If you are free to visit Rochester, NY on August 16-20, take advantage of the opportunity to spend some time with us! The little ad running with this column touches on the high points, so I won't say much more. For more information, visit the AWA website www.antiquewireless.org and the special convention website www.awaconference.com. The latter offers an opportunity to register on line. Hope to see you there!

Antique Wireless Association 2011 World Convention

AUGUST 16-20

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*Enjoy the Fellowship – Learn from the Programs –
Acquire or Sell Radio Treasures*

This Year's Theme:

50th Anniversary of the AWA Convention

- | | |
|--|---|
| <input type="checkbox"/> Visit the AWA Museum | <input type="checkbox"/> Expanded Old Equipment Contest |
| <input type="checkbox"/> Round-the-Clock Flea Market | <input type="checkbox"/> Special Event Ham Station |
| <input type="checkbox"/> Movie Night, Pizza Dance Party, Ladies' Luncheon, Banquet | <input type="checkbox"/> Forums and Presentations |
| | <input type="checkbox"/> Saturday Auction Includes Items from Several Estates |

From exit 46 of the New York Thruway (I-90), take I-390 North to NY 253 West to NY 15 South. Look for the RIT building about 0.7 miles on the right. More information at www.awaconference.com



ANTENNA TOPICS

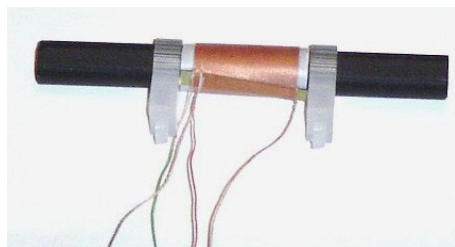
BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Dan Farber, ACOLW
danfarber@monitoringtimes.com

Antennas for AM Listening *Hint: It's Not A Beam!*

This time around, friends, let's take a look at receiving antennas for the AM broadcast band. Back in the day, we called it "BCB," or sometimes "MW," for medium wave. Well, it was the sixties, and acronyms for everything was cool. What's really cool is that, even though FM, XM, and other newer radio services have come into vogue along the way, good old AM continues to serve its purpose. A number of commercially produced antennas for AM continue to be available to the eager consumer – and of course, we can always make our own.

If you're in the habit of thinking about "conventional" antennas such as we might use at higher frequencies, like dipoles, verticals and so forth, you'll have to go outside the box a bit to get your head around most of the popular AM antenna ideas. The designs we use at HF just aren't practical on the AM band. For example, a full-size dipole for 1000 kHz, in the middle of the band, would be 468 feet long! A full-size quarter-wave vertical at the same frequency would be 234 feet tall – not at all easy or convenient (or even legal) to erect in the typical back yard. Not to mention the obvious problems as lightning attractor and air traffic hazard, or the tremendous amount of noise it would pick up along with the desired signals.



A typical ferrite loopstick antenna. (Image courtesy www.stormwise.com)

Fortunately, a number of alternate solutions exist. No doubt the most prevalent, taking a number of different forms, is the *loop antenna*. This, as its name might imply, is a loop of wire, wound on various forms, in a number of different sizes and configurations. The beauty of this idea is that it fits a long piece of wire – essential in an antenna for these low frequencies – into a physically small and manageable package.

After all these years, the one that still impresses me the most is the very small loop antenna that has been used from day one *inside* "pocket size" radios. This takes the form of a coil of small diameter wire wound on a round rod (or flat rectangle) of ferrite, which is basically a ceramic compound composed largely of iron oxide. Such a coil, wound on ferrite, is often called a *loopstick*. The ferrite increases the coil's



Back view of 1948 Philco table radio. Note the loop antenna wound on the inner rear perimeter of the box. (Image copyright 2003-2010 Daryls Clocks Galore)

inductance considerably, making it appropriate for use at these low frequencies. Ingeniously, the coil serves as both the inductance of the radio's tuning circuit and as the antenna.

What makes it possible to use such a physically small, internal, antenna for AM reception is mainly two simple facts: local AM stations are close by, and they run considerable amounts of power. This small antenna is woefully inadequate for DX listening. However, the majority of AM listening centers directly on these local stations, where the small antenna is certainly adequate. Thus it can be concealed inside a very small, portable radio. Kind of ironic, when we consider that ham and SWL operation, which take place at higher (in many cases, much higher) frequencies, nevertheless require much larger antennas! It's the combination of "close by" and "high power" that makes this setup work well.

Before those pocket radios ever came along and for quite some time after their appearance, the AM "table radio" was very popular. These tube-

type radios, powered from a wall outlet, with a speaker built in and the antenna inside the cabinet, were quite a stride beyond the radios of the 1920s and '30s, with their bulky external loudspeaker (or worse yet, headphone-only operation), big clumsy external antenna, and messy and hazardous battery power sources.

The internal antenna usually took the form of an open loop of wire wound inside the cabinet, as shown in this quaint 1948 Philco radio, or sometimes as a "pancake" on the inside of the back cover. Notice that since the loop is *physically* much larger than the little loopstick, a ferrite core is not needed to increase the inductance. (Increasing a coil's *diameter* is one of the easiest ways to increase its inductance, and when it's being used as an antenna, a large coil with few turns will intercept more signal than a small coil with many turns, even if their measured inductance is the same.)

Later on, as solid-state receivers began to replace tube-type units, the compact ferrite loop antenna made a reappearance, mounted externally on the backs of numerous home stereo receivers. Eventually these, too, became *passé* and manufacturers began providing small, open loop antennas in a plastic frame, to be connected to AM antenna terminals on the back of the receiver.

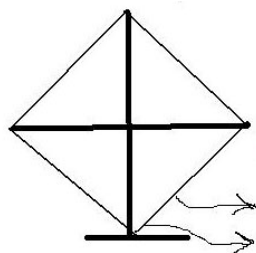
If you have an AM receiver with antenna terminals, there's no limit to the antennas you can try. Again, since most AM listening centers on local, high powered stations, antennas aren't terribly critical. Any sort of random wire or other miscellaneous antenna will certainly give the local AM listener all the coverage desired. If you're interested in DX listening at night, though – and let me hasten to say that this is quite a bit of fun – you'll need something more robust as an antenna.

One of the easier things to try is to hook up that big dipole or longwire that, as a ham or SWL, you may already have. Of course, it'll be quite short at the AM broadcast frequencies. However, at night, when long-range propagation kicks in, assisted by the fairly high power that AM broadcasters usually run, you might be pleasantly surprised by how much "BCB DX" you can haul in with such a dipole or longwire.

With the longwire, try hooking the other antenna terminal to a cold water pipe ground. Depending on the length of your ground wire – and whether you hooked it to a metal or a plastic cold water pipe! – you may get a dramatic improvement in signal strength. The big drawback here is how *noisy* this setup is. That's the beauty of the dipole: its "balanced" configuration helps greatly to cancel noise, which can be really fierce at night on these lower frequencies.

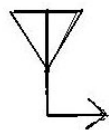


A typical small loop supplied nowadays with home stereos. (Photo by author)



loop antenna

or



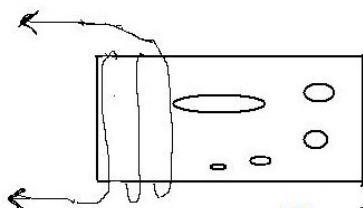
outdoor aerial



cold water pipe ground

Another popular and effective solution is to turn once again to our old friend the loop antenna. If we arrange a physically larger loop than the internal ones we've been looking at, we can increase our "aperture" and haul in more of that nighttime DX. I described here, in my October 2010 column, a rather crude homemade loop that will start you down this road. Or you can consult Kevin Carey's excellent "Below 500 kHz" monthly column here in *Monitoring Times* to see some beautiful loop-building information. A loop, of course, has that same "balanced" nature that a dipole has, and thus can be very

few turns of insulated wire



AM radio

Improved antenna setup for radio without external terminals. (Drawing by author)

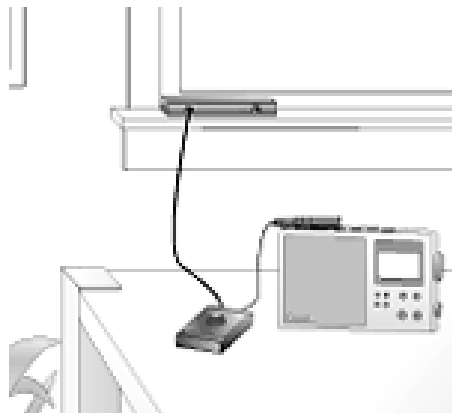
effective at reducing received noise.

If you don't have antenna terminals on your radio, try this slick solution. Wrap several turns of insulated wire *around your radio* and connect the two ends of the wire to the two wires of a loop antenna, or even one to an outdoor antenna and one to a cold water pipe ground. This is a neat little demonstration of the transformer concept. Reception of distant stations will improve dramatically. (Note: Your radio must have a plastic or wood case for this to work!)

The C. Crane Company sells an interesting variation on this last idea. The unit consists of a

loopstick antenna in a plastic case, to be placed on a convenient window sill, connected by cable to a small preamplifier. A second cable connects this to a smaller encased loopstick that you place on top of your radio. You can learn more about this nifty setup on their website, www.ccrane.com.

This scratches the surface of what we can do with antennas for AM radio listening. Hopefully I've given you some ideas to try and to think about. There's plenty to listen to and enjoy on this band, both day and night. I encourage you to give it a whirl, or to revisit AM, if you haven't listened to it in a while. Join me here in the October issue, where we'll delve ever deeper into the world of antennas. Happy operating!



C. Crane Company's nifty AM antenna setup. (Image courtesy www.ccrane.com)

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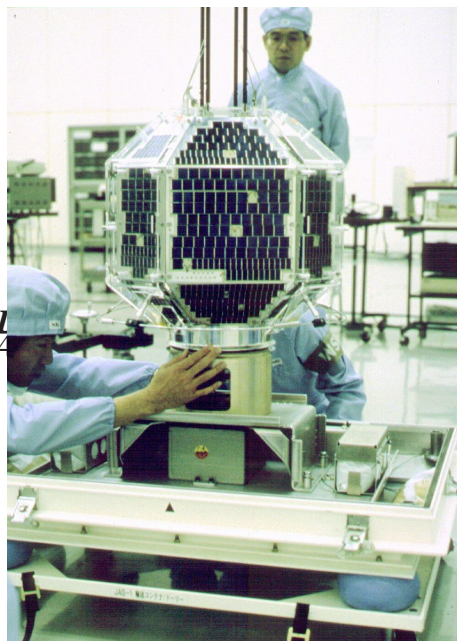
Spotlight on the Japanese Amateur Radio Satellites

In previous columns, I've been showing readers how to equip their stations, watch for, track and then (for those so licensed and equipped) actually work through our various amateur radio satellites now in orbit.

In this installment, I'll be turning the spotlight onto a whole series of amateur radio satellites that were built, launched and controlled by our friends in Japan. One of these satellites still remains semi-operational to this day. I'll also bring our readers up to date on the latest on-orbit status of our most popular amateur satellite (AO-51) as well as an update on AMSAT's yet-to-be-tossed-overboard ARISSat-1.

❖ The FUJI Satellites

The very first Japanese amateur radio satellite, JAS-1a (which later became Fuji-Oscar 12 on orbit) was launched on August 12, 1986 on the very first test flight of Japan's new H-I launcher developed by Japan's National Space Development Agency (NASDA). It was part of a piggyback payload that rode into a nearly circular, 1497 x 1479 Km, Low Earth (LEO) orbit along with a Japanese experimental geodetic satellite called AJASAI (EGS). The FO-12 satel-



Technicians put the finishing touches on the launch mechanism of JAS-1b, a linear transponder-equipped satellite that later became FUJI-OSCAR 20 (FO-20) in orbit. (Courtesy JAMSAT)

lite consisted of a 26-sided polyhedron (about the size and shape of a large basketball) and weighed in at about 50 kg.

FO-12 was the first Japanese amateur satellite developed by the Japan Amateur Radio League (JARL) with system design and integration performed at Japan's NEC Corporation. Unfortunately, eclipses kept FO-12 from producing enough electricity to keep it switched on for an entire orbit and it was eventually taken out of service on November 5, 1989 when the battery failed.

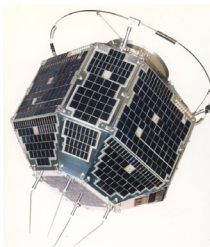
❖ JAS-1b (Fuji Oscar 20)

Fortunately, Japanese hams had a replacement satellite ready for launch three months after FO-12 had to be turned off. JAS-1b became the seventh amateur radio satellite hurled to space in 1990 and was renamed Fuji-Oscar 20 soon thereafter. Another H-I rocket provided by NSADA ferried the 50 kg JAS-1b to a 750-mi.-high orbit on February 7, 1990. This H-I also carried two government satellites, MOS-1b and Debut, and it marked the very first time Japan had launched more than two satellites at one time.

There were many positive features of FO-20. Its orbit was somewhat more elliptical than the most other LEO amateur satellites, so it often provided a somewhat larger footprint at Apogee and, therefore, a much larger area for potential contacts. I made many enjoyable contacts though this satellite, once I got used to FO-20's very rapid Doppler shift on the 70 cm downlink.

❖ The Benefits of Mode J

But the 70 cm downlink was not without its benefits. Indeed, for those who were so equipped, the 70 cm downlink of FO-20 provided many users with a way to escape the inherent man-made noise that's often present on both 10 and 2 meters, which, up to that point had been the "traditional" downlink frequencies for most of our amateur radio satellites. In many areas of the world, the 2 meter band is so crowded (or filled with electrical and other noise) that it makes satellite weak signal work nearly impossible.



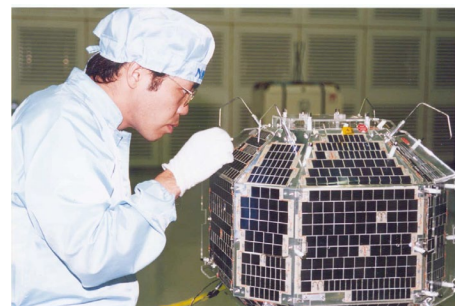
JAS-1b (FO-20) as it might have appeared in orbit. (Courtesy: JAMSAT)

Most of this interference is not present at 435 MHz, and spectrum space is somewhat less crowded at that frequency. So Mode J operation (2m up/70cm down) is often much preferred to Mode A (2m up and 10 meters down) or Mode B (70 cm up and 2m down) in those areas.

Unfortunately, for all of its positive aspects, FO-20 is no longer operational. However, once again, before it went silent, our Japanese compatriots had a follow-on satellite, JAS-2, built and ready for launch.

❖ JAS-2 (Fuji Oscar 29)

JAS-2 was successfully launched by NASDA, the Japanese National Space Development Agency, from their Tanegashima Space Center in southern Japan in August 1996 to become amateur radio's first new orbiting satellite of that year. As with their previous satellites, JAS-2 was principally designed by a team from the Japan Amateur Radio League (JARL) and was later built almost entirely by NEC under contract



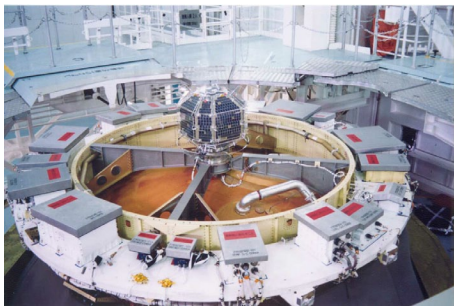
A technician makes a final adjustment to the JAS-2 satellite prior to launch in 1996. Later re-named FUJI-OSCAR 29 (FO-29) on orbit, the satellite is still "semi-operational" to this day. (Courtesy: JAMSAT)

from JARL.

Soon after JAS-2 successfully reached orbit, JARL requested that an OSCAR number also be assigned to their handiwork by the worldwide AMSAT community. The name Fuji OSCAR 29 (or just FO-29) was quickly given to the new satellite.

FO-29 contained both an inverting linear as well as packet radio transponder on board. It also contained a magnetic torque system to spin stabilize the satellite in a planned attitude perpendicular to the orbit's plane.

When its Mode J linear transponder was activated soon after launch, FO-29 provided very strong downlink signals, much stronger, in fact, than its aging FO-20 cousin. Also, FO-29 tended



JAS-2 (FO-29) is dwarfed by its carrying structure. A Japanese H-II rocket launched from Japan's Tanegashima Space Center in southern Japan successfully placed the satellite into a circular, Low Earth (LEO) orbit. (Courtesy: JAMSAT)

to strongly favor either left-hand or right-hand circular polarization depending on how the satellite was oriented with respect to the Earth.

Besides the stabilization system, there were many other electronic improvements carried aboard FO-29. The most obvious improvement was that, in addition to a 1200 bps AX.25 packet modem and BBS system, FO-29 also sported a 9600-baud FSK transponder as well. There was also a "digitalker" on board that stored and repeated about 25 seconds of speech unlinked from the FO-29 command station for later "broadcast" via the 435.91 MHz FM downlink. When its digitalker was activated, I still remember hearing it come over the horizon repeating the phrase, "This is JAS 2" over and over again in a digitized female voice. Another, less obvious improvement included the use of gallium-arsenide solar cells with a much higher efficiency (17%) than those carried on other satellites of the era.

Unfortunately, 15 years of exposure to the harsh environment of space has now taken its toll on FO-29 to the point that only the linear, Mode JA transponder is "semi-operational." It's been reported that the satellite's batteries are continuing to slowly fail due to long periods of darkness in some parts of its orbit. This condition has caused FO-29's ground handlers to keep the satellite completely switched off for upwards of several months at a time. But, when activated, this satellite is still a pure joy to work through. Hopefully, we will get a few more years of use out of this old bird before it goes completely silent.

The latest on-orbit status of FO-29 is always available via the AMSAT web site at: www.amsat.org/amsat-new/satellites/satInfo.php?satID=5&retURL=/satellites/status.php

❖ AO-51 Also Ailing

AMSAT Vice-President of Operations Drew Glasbrenner, KO4MA, recently reported that the AO-51 Command Team was having an extremely difficult time trying to restore AO-51 to full operation. Unfortunately, after nearly 7 years in orbit, this satellite's batteries have also now deteriorated to the point that the onboard computer will not retain an upload of the flight software during the time the satellite is eclipsed by darkness.

The AO-51's ground handlers still have a few more things to try in an attempt to restore AO-51 to full operation. However, with the length of eclipses peaking sometime this summer at approximately 27 minutes, the long-term outlook

for the continued use of AO-51 remains uncertain. Fortunately, there is a brief period in November 2011 when eclipses will be as short as 16 minutes. But, after that, the length of time the satellite is in darkness on every orbit will remain at 30 minutes (or longer) for many years.

At press time, members of the AO-51 Command Team were also experimenting with ways to command the satellite "ON" during each orbit once it regained enough power from its solar panels. However, this restoration approach requires that someone be physically present at a command station to perform a manual reset of the satellite on each orbit. Stations with 96K digital capability can listen in on control station attempts at recovery on 435.150 MHz on many passes over the US. And, as always, the latest information about AO-51 restoration attempts and its current status can be found at: www.amsat.org/amsat-new/echo/CTNews.php.

❖ Failure is Inevitable

The "lesson learned" from all of this is that, despite the very best efforts of our extremely capable satellite experimenters and dedicated ground handlers, any satellite that contains delicate electronic equipment and which is repeatedly subjected to the harsh environment of space for extended periods of time *will* eventually fail. And the best way to insure new amateur satellites will be built and launched to replace those that do is to generously support your country's non-profit AMSAT organization in whatever way you can.

❖ ARISSat-1 Update

As I reported to you in the May issue, the ARISSat-1 satellite was intended to be activated in April as part of the 50th anniversary of Yuri Gagarin's famous flight. However, when the crew tried to do so, no ground stations reported hear-



Three members of the ARISSat-1 experimenter team pose with the working engineering model of ARISSat-1 at AMSAT-NA's 2010 Annual Meeting and Space Symposium. From left are Lou McFadin, W5DID, Bob Davis, KF4KSS, and Doug Quagliana, KA2UPW. Symposium attendees got a chance to work through the new satellite's transponders with their radios during the conference. (Courtesy: KB1SF)



An ISS crewmember holds AMSAT's (still partially wrapped) ARISSat-1 satellite just after its unpacking from a Russian Progress re-supply vehicle. EVA deployment of the satellite was tentatively re-scheduled for July 2011. (Courtesy: The ARISSat Team and Energia)

ing the satellite. To follow up, the ARISSat-1 team had a teleconference with representatives of RSC-Energia (Russia) and NASA to request a clarification of the events leading up to this incident and to discuss what happened.

According to RSC-Energia officials, the battery in ARISSat-1 was only charged once on the ground and was then used for a variety of tests as well as during its February activation event once it arrived on the International Space Station (ISS). The battery was not recharged prior to the April Yuri Gagarin activity since it can only be charged a limited number of times on the ISS.

Also during the April event, the cosmonauts reported that they activated the satellite and confirmed that they heard the signal on the amateur radio equipment on board the ISS. Since the battery was nearly depleted of its original charge, they then switched the

satellite off after six hours of operation in order to prevent over-discharging the battery. The battery was then removed from the satellite and stored separately according to their normal battery handling procedures. Readers may recall that the battery donated to AMSAT for use in ARISSat-1 is the same kind of battery used in the Russian extravehicular (EVA) space suits, so the crew is well familiar with its electrical characteristics.

RSC-Energia officials have since reported that their plan is to have the crew recharge the battery about three weeks prior to the EVA deployment. This will give the cosmonauts ample time to reinstall the battery and test the satellite to make absolutely sure that it is working properly before it is tossed overboard.

At press time, the EVA deployment for ARISSat-1 was planned for late July of this year. Hopefully, by the time you read these words, ARISSat-1 will be nearing that long-awaited milestone, or (fingers crossed) even be operational in orbit. To help you prepare to listen for (or work through) ARISSat-1 once it is finally deployed, I suggest you one again check out my column in the February 2011 edition of *MT*, where I outlined all of the satellite's planned on-orbit features, as well as its uplink and downlink frequencies. In the interim, stay tuned to the AMSAT Web site (www.amsat.org) and the ARISSat-1 Web site (www.arissat.org) for all the very latest information about ARISSat-1.



This is the 28 Volt Orlan Spacesuit battery whose lack of a full charge precluded ARISSat-1's on-orbit test in April. Russian Space Agency officials assured AMSAT that this battery would once again be fully charged and inserted back into the spacecraft prior to ARISSat-1 being tossed overboard. (Courtesy: The ARISSat Team and Energia)

Mode S – IFF for the 21st Century

By Larry Van Horn, N5FPW
Monitoring Times Technical Editor

Our topic this month is the new monitoring buzzword that excites the aviation monitoring community like no other. Used in conjunction with aircraft capable scanners, suitably equipped radio hobbyists can dramatically increase their situational awareness of airspace usage in their local area. For many of us, it has provided a spark in our civilian and military monitoring hobby that we haven't had since the introduction of the first programmable aviation scanners.

So what is this magical buzzword? Mode S!

In the July 2011 *On The Bench* column, I presented some background material on the history of aviation's IFF (Identification Friend or Foe) mode that is the ancestral lineage of today's Mode S.

In this month's *Bench* column, I will cover a brief history of Mode S, some of the basics parameters of the mode, and how mode S interrogation and reply actually work.

❖ History of Mode S

In 1967 the newly formed government agency, the Department of Transportation (DoT), and its department head wanted a complete reassessment of the U.S. Air Traffic Control (ATC) System. To conduct the reassessment, DoT formed the Air Traffic Control Advisory Committee in 1968. Several key recommendations were made by this committee, including a new ATC system. It was determined that the old ATC Radar Beacon System (ATCRBS) was inadequate.

By the early 70s, an air traffic control technology had been developed by Lincoln Labs at the Massachusetts Institute of Technology. This technology, initially known as the Discrete Address Beacon (DABS) project, was later renamed Mode-S.

The Lincoln Labs DABS specification was delivered to the FAA in 1975 and the first commercial Mode-S transponder was manufactured in 1980. But the FAA was still slow to

implement the new ATC standard, until a mid-air collision in 1986 over Cerritos, California, changed everything.

As a result of that Aeroméxico Flight 498 mid-air collision with a privately operated Piper PA-28-181 aircraft, Congress passed a law mandating that all commercial aircraft be equipped with a Traffic Collision and Avoidance System (TCAS) by 1993. TCAS uses mode S and it has been accepted as an international standard by the International Civil Aviation Organization (ICAO).

The idea behind this new technology was to develop a way of using the same Secondary Surveillance Radar (SSR) that was being used in IFF modes A and C, but to make it addressable, more accurate, reliable, and capable of greater capacity.

❖ Interoperability Helped Design Mode S

Air traffic control is a unique problem in that every aircraft in a given airspace must be tracked by a ground station. In a hybrid system, both systems must be able to operate in conjunction with the components of the other, in order to ensure the safety of all aircraft. The Lincoln Lab designers of Mode S were acutely aware of this problem and were determined to build a new air traffic control technology that would interoperate seamlessly with the existing system.

The deployment of any new air traffic control technology is always incremental. Out of necessity there will always be a long transition period during which both new and old systems must coexist. Adoption of a new air traffic control technology requires upgrading hundreds of ground stations, installing new equipment in thousands of aircraft, and training tens of thousands of people to use the new system.

Also, a new air traffic control system cannot assume that every aircraft will be fully compliant with the new standard. The global nature

of aviation and the relative ease with which a pilot may fly aircraft virtually guarantees that some aircraft will not have the latest in air traffic control technology.

The developers at Lincoln Labs made several specific design decisions that were influenced by interoperability with existing ATC system, and these included:

- Frequency – the choice of 1030/1090 MHz was made so Mode S and ATCRBS could communicate on the same channel.
- Modulation – the modulation scheme was chosen partially to minimize the effects of interference due to shared frequency channels.
- Signal Formats – the Mode S signal itself had to be designed so that it was transparent to existing transponders.
- Error Correction – ATCRBS limitations forced the Mode S signal to be short, so parity and addressing bits were overlaid to maximize data block size.

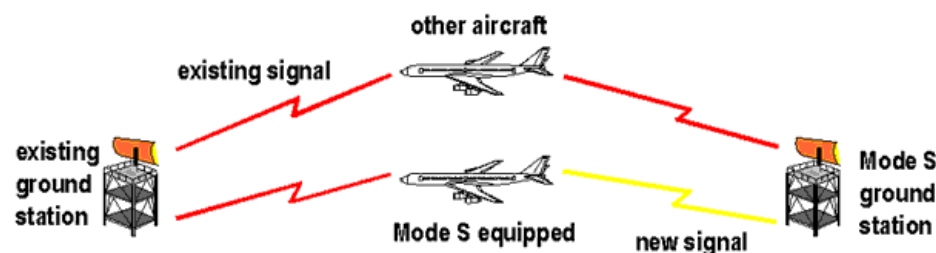
❖ Mode S and How it Works

Mode S or "Select" is a datalink technology that uses discretely addressed interrogations. Mode S equipment includes ground stations with sensors, and transponders aboard aircraft with unique addresses or identifications. The interrogations that ground sensors send planes include the identification information of the target plane. This method ensures that when other aircraft receive the interrogation, they will not respond. Replies contain information such as altitude reports.

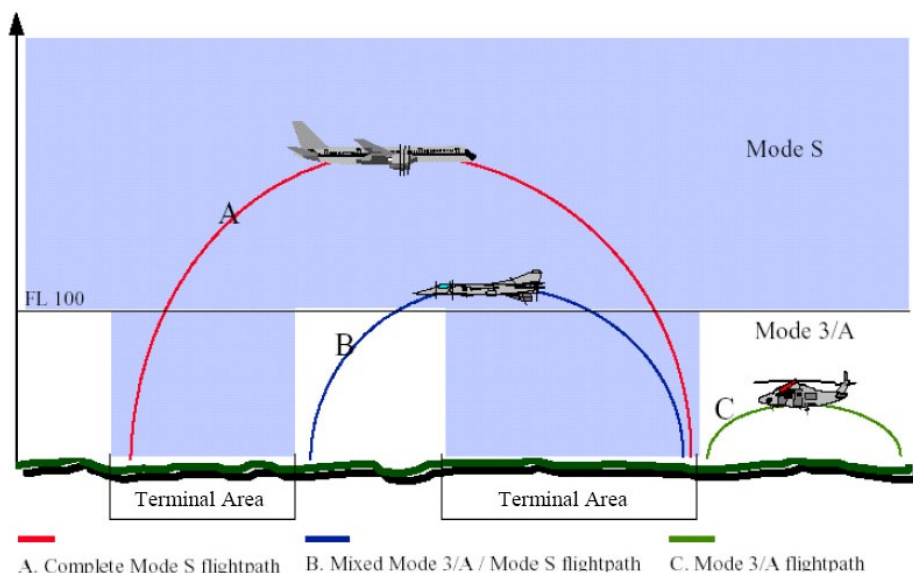
Mode S, despite being called a mode, is actually a radically improved ATC system intended to replace the previously mentioned ATCRBS altogether. All the countries in Europe have mandated the usage of mode S as of March 31, 2009. Many other countries, including the United States, have begun phasing out ATCRBS in favor of this system.

Despite being called a replacement transponder system for ATCRBS, mode S is actually a data packet protocol which is being used to augment existing transponder positioning equipment (radar and TCAS).

As I mentioned above, Mode S has the ability to interrogate a single aircraft at a time. With old ATCRBS technology, all aircraft within the beam pattern of the interrogating station would reply. In airspace with multiple interrogation stations, ATCRBS transponders in aircraft could be overwhelmed. By interrogating one aircraft at a time, workload on the aircraft transponder



Interoperability Overview, courtesy of MIT



Cross Section of Mode S Airspace, courtesy of US Navy

is greatly reduced.

Another major improvement with the implementation of mode S is increased azimuth accuracy. With primary and secondary surveillance radars (PSRs and old SSRs), the azimuth of the aircraft is determined by the half split method. The half split method is computed by recording the azimuth of the first and last replies from the aircraft, as the radar beam sweeps past its position. Then the mid-point between the start and stop azimuth is used for aircraft position.

This requires many interrogations and replies, reducing the target-handling capacity of the ATC SSR. The mode S system uses a monopulse SSR, which has an electrically narrowed beamwidth, typically 2.5 degrees. Apart from better azimuth accuracy the monopulse technique reduces the number of interrogations required to track a target, as it theoretically requires only one reply to obtain the azimuth and range of the airframe. This is calculated based on the RF phase of the aircraft reply, as determined by the sum and difference antenna elements, and is called monopulse. This monopulse method results in superior azimuth resolution.

The Mode S system also includes a more robust communications protocol for a wider variety of information exchange. Many years ago, mode A and C were developed for airframe identification and altitude reporting. This was and still is an important component of air traffic control and air space management. As more and more airframes were available to the private and commercial flying community, this basic form of surveillance was overwhelming the capacity of the air traffic control radar beacon system (ATCRBS).

Given the technology behind the mode A and C interrogation and reply, there were also problems with the "false reply uncorrelated in time" or FRUIT. This involves seeing replies from another interrogation, garbling one reply, and interfering with another. The problem is analogous to attempting to listen to several conversations at the same time. As such, the

capacity of the ATCRBS was being taxed to its limit.

❖ Interrogation and Reply

The basic ATCRBS system relies on pulsed RF as its means of communications. These pulses are 0.8 μ s wide and vary from 8.0 μ s to 21 μ s spacing for mode A and C respectively. The side lobe suppression or SLS P2 pulse is also transmitted omni-directionally and is used to suppress any replies to side lobe interrogations.

The mode-S SSR will interrogate using a 1030 MHz carrier with differential phase shift keying (DPSK) modulation. DPSK allows the interrogation frequency to have much more efficiency in sending information without interfering with mode A and C interrogations. DPSK also allows up to 4 MBps of data. The ground radar sends its 1030 MHz, DPSK interrogation signal, the airframe receives it, verifies the request and integrity of the signal, and replies using a 1090 MHz carrier encoded with a pulse positioning modulation (PPM) transmission.

The SSR is central to the mode S system. Mode S interrogations are generated at a rate of 50 times per second or 50 Hz pulse repetition frequency (PRF) and approximately 230 Hz for mode A/C interrogations. The reply will happen at the same PRF although mode-S SSR has the ability to tell the mode S transponder not to reply to every mode S interrogation it receives. Once the SSR has received the reply, it will decode the mode (A, C or S) and demodulate the information within each mode.

There are three interrogation types in a mode S SSR system:

- **ATCRBS all call** – This interrogation consists of pulse P1, P3 and a 0.8 μ s P4 pulse. P2 SLS is transmitted as normal. All ATCRBS transponders reply with the 4096 identification code for mode A interrogations and altitude data from mode C. Mode S transponders do not reply on this interrogation.
- **ATCRBS/mode S all call** – This interrogation is identical to the ATCRBS all call above except P4 is 1.6 μ s long. ATCRBS transponders reply with the same 4096 code or altitude data used by

the ATCRBS all call. Mode S transponders reply with a special code, which contains the aircraft's discrete address.

- **Mode S discrete interrogation** – This interrogation is directed at a specific mode S transponder-equipped aircraft. The interrogation consists of pulses P1, P2 and P6. P2 is transmitted via the directional antenna and hence is the same amplitude as the P1 and P3 noted above. This effectively suppresses ATCRBS transponders from replying. P6 is actually a DPSK data block that contains either a 56-bit or 112-bit message. The DPSK modulation produces a spread-spectrum signal, which is immune to interference.

When the aircraft transponder receives a valid mode S discrete interrogation, it will return a reply at 128 μ s after reception. The reply is transmitted on 1090 MHz and uses a 56-bit or 112-bit PPM (pulse position modulation) transmission.

❖ The Aircraft Mode S Address

Each mode S interrogation will have a 24-bit address unique to the aircraft (entered in as an 8-digit octal) as well as a 24-bit parity check for validation. Aircrews must ensure that the tail-number-assigned 24-bit code matches exactly to the default code for that particular aircraft.

Within the U.S. Department of Defense (DoD), the use of dynamic codes is an alternative, but only in accordance with DoD service specific guidance.

The basic mode S surveillance interrogation information is limited to the following: altitude reporting (DF0), aircraft identification (DF4) and basic airframe information (DF11). DF stands for download format and I will have more on that in a future column.

According to the ICAO standards for mode S, aircraft addresses shall be assigned to aircraft in accordance with following principles:

- At any one time, no address shall be assigned to more than one aircraft. Erroneous or duplicate codes compromise the safety and efficiency of air traffic control.
- Only one address shall be assigned to an aircraft, irrespective of the composition of equipment on board.
- The address shall not be changed except under exceptional circumstances and shall not be changed during flight.
- The addresses composed of 24 zeros or 24 ones shall not be assigned to aircraft.

In conjunction with programming the mode S control panel in DoD aircraft, I found this note in the DoD FLIP General Planning publication, chapter 4. Those of you who have mode S capability will find this statement interesting.

"Mode S aircraft identification entry must be entered in accordance with this reference and limits the entry of flight ID to seven alphanumeric characters. It is imperative also that the callsign entered in the flight plan (seven characters) match exactly to the flight identification entered into the mode S transponder interface"

This article has introduced some of the subtleties that make mode S monitoring an important tool for the aircraft enthusiast. I will have more on the operational and monitoring aspects of mode S and ADS-B in a future *Monitoring Times On The Bench* column.

Apple TV – Let it change your life

By Loyd Van Horn, W4LVH

I am a self-admitted tech-junkie, but I wasn't always like this. There was a time, before I purchased my first iPod, that this type of stuff didn't really hold much appeal to me.

Sure, I have been an active Web surfer since 1993, have had WiFi in my laptop since 2003 and made the change from CDs to Mp3s without hesitation in 1999. However, it wasn't until I purchased my first iPod that the little light went off in my head and the entire future of my daily life flashed before my eyes in monochromatic LCD-screen glory.

The iPod changed my life in ways that I never anticipated possible from a music device. This had me on the lookout for other gadgets that could simplify or enhance my daily activities. I didn't anticipate that the next product to turn my world on its ear would be another product from Apple.

The first Apple TV release seemed interesting in concept, but the feature list wasn't quite on par with what I wanted to do, plus the price was way too high. Then came Apple TV 2.0 and I was ready to take the plunge. For those still on the fence, hopefully this review will entice you to come aboard.



It might not seem like much – a small 3.9" W x 3.9" D x 0.9" H black box with a few connection ports. But trust me, there is plenty of "punch" under the hood. My focus for this review will be mainly on using Apple TV as a streaming radio device, but I will also touch on some of the other features that you might find useful.

Word of note: Apple TV is not a TV; it is a streaming interface to a TV. You will need a TV or receiver that handles HDMI connections, or something with an adapter, because Apple TV only works in HDMI (audio and video) or fiber optic (audio only). You will also need an internet connection – either wireless or Ethernet.

❖ Out of the Box

Apple TV, like so many of the products coming from Apple, comes in a minimally packaged box containing the Apple TV device, the AC power cord, the aluminum remote and a 33-page setup guide.

After taking out the Apple TV device, the next thing you will see is the 3-button aluminum remote. The remote is extremely intuitive with a menu button, a play/pause button, and a select button that is surrounded by navigation arrows for going through the various menus. The remote is made of the same aluminum material as iMac and MacBook Pro laptops.

The set-up guide is extremely easy to read and has the same user-friendly feel that has



made Apple a leader in the computing industry. It breaks down how to navigate the menus and connect to your network to the wireless a/b/g/n connection or through the 10/100 Base-T Ethernet port in the rear of the device.

The device itself is very basic. The top and sides are made from smooth plastic, with the top frosted except for the Apple TV logo. The bottom is rubberized to help prevent skidding on surfaces. The front side of the device houses a small, blue light to indicate when the device is in use, but it is recessed, so unless it is actually operational you won't see it. The back panel has the various connection ports: the port for the AC power adapter, an HDMI port (this is the only way to connect for video streaming), an optical audio port, an Ethernet port, and a micro-USB port for "service and support."

As media devices go, this one should be hardly noticeable at all in your home theater setup. It is sleek and stylish enough, but it is designed to operate in the background. It runs quiet and cool; I don't think I have heard a single sound from my device in the six months I have been using it.

Mine sits on top of my AT&T U-Verse set-top box very easily. I note that when plugged in with my HDMI cable, the cable sometimes pulls the Apple TV box at an angle, which makes remote control use a little more spotty. It just took moving the cable around to get my Apple TV device to sit squarely where I wanted it.

The AC adapter is a sleek, thin, 2-prong plug. In the days when so many devices are turning to large wall-warts, the Apple TV plug is easy to incorporate into even the most packed power strip or outlet.

The rest of the operation of Apple TV happens on-screen. Getting the unit up and running takes very little time at all. The speed at which your device operates will largely depend on the speed of your network (including signal strength of your wireless router).

❖ The Set-up

I have set up many devices to connect to my home-theater system and to my wireless network, but as yet, I hadn't combined a device with both of them. I was a bit apprehensive that this might be a complicated process, but Apple once again has made it relatively painless.

I started with my HDMI cable plugged into the back of the Apple TV device. From here, you decide where you want to send the Apple TV signal. If you are running all of your devices through just your HDTV, you can just plug it into

RATINGS

Audio Quality – 4.5 out of 5

Audio/video sync issues are rare; otherwise audio quality is excellent

Video Quality – 4.5 out of 5

Occasional buffering/digital noise, but this too is rare. The 720p picture quality is stunning.

Performance – 5 out of 5

Never had any issues, it just does what it is supposed to do when you want it to do it.

Features – 4.5 out of 5

AirPlay is genius; other features are fantastic, too. There are a few I would still like to see added, but I am too busy playing with Netflix and AirPlay to care right now.

Design/Appearance – 5 out of 5

They got it right: no big bulky device with a wall-wart, this is sleek, simple, hidden and sufficient.



Overall rating – 4.75 out of 5

This is pretty close to perfect. A few features still need to be added to round it out, but please, go out and buy one now. You will thank me later.

one of the HDMI inputs on your television. If you are using a surround sound receiver, use one of the HDMI inputs there.

I had to improvise a little. My surround sound receiver's inputs were all full, but I wanted to still route audio from Apple TV through my surround sound (there is some Dolby Digital 5.1 audio to be found on Apple TV). So I plugged the HDMI cable from Apple TV into one of the inputs on my television, then used the fiber optic output from the TV into one of the fiber optic inputs on my receiver. I include this information, knowing that many receivers have only three HDMI inputs. If this is the case with your system, the above workaround works splendidly.

Once everything was plugged in, all I had to do was tell Apple TV how to connect to my wireless network. Doing so is relatively easy if you have any experience in entering text through a remote control or other non-keyboard interface. Once you have set up your wireless network and you are connected, you can begin to enjoy all that Apple TV has to offer. Once you get everything set up, you can also use the Apple Remote App on your iOS device, which allows you to type text in on the touchscreen keyboard.

❖ The Performance Test

There are so many features within Apple TV, that you could literally write an entire book to discuss them at length, so I won't even try. I will begin with Internet Radio, since that is the aspect of Apple TV that will most likely interest our readers.

If you have any experience at all with the streaming radio content on iTunes, then the Apple TV Internet Radio experience is going to be a breeze for you. You simply go to the main menu, select 'Radio' under the 'Internet' option and then select the genre for which you would like to find a station. If you have set up your favorites in iTunes using your iTunes account, you should be able to access them on Apple TV as well.



While there are a large number of Internet-only and a good number of terrestrial broadcasters on iTunes, it is by no means comprehensive. Wouldn't it be great if you could use your favorite iOS internet radio app to stream radio stations from your device through Apple TV? Well, you can, and this is because of one of my favorite features of Apple TV – AirPlay.

AirPlay allows you to stream content from your iOS-enabled device (iOS 4.2 or higher) through Apple TV, as well as music and videos from iTunes. Many media apps available on

iOS devices now have the ability to stream their content through AirPlay; just look for the AirPlay logo (it looks like a box with a pyramid in the middle). Many of the popular media apps have AirPlay capability now, including Pandora, TuneIn, YouTube, iHeartRadio, and more.

So, if you find the iTunes Internet Radio station list to be inadequate, have no fear, your iOS device with your favorite Internet Radio app is ready to save the day.

Other than AirPlay, you will also find Apple TV packed with a ton of other worthy features. I had avoided Netflix for years until I tried the free one-month trial. I now gladly pay the \$7.99 per month fee for unlimited streaming through my iPhone, my PC and Apple TV. There are also movies and TV shows through iTunes, podcasts, NBA/MLB games, Flickr photo sharing, and a lot more.



A few minor things came up in performance testing. Every once in a while, the audio and video will lose sync. The fix for this was simply pausing the content, rewind slightly, and resume the program. Also, there would occasionally be a hiccup of digital noise or buffer issues when streaming video, but this, too, was rare. Other than this, my experience with Apple TV over the past six months has been virtually bulletproof.

As an Internet Radio streaming source, the combination of streaming my apps through AirPlay makes this invaluable and definitely the easiest way to stream Internet Radio through my surround system.

❖ The Final Word

Apple TV hasn't quite reached the end-all-be-all convergence of my media and entertainment world status just yet, but it is getting there.

Once Apple opens up the ability for me to stream any audio or video content from my computer or mobile device – and once there is somehow a combination of a gaming system, satellite/cable television package and App-based content – then Apple TV will take its place as the most necessary device in your home next to your TV, phone and computer.

As it stands, Apple TV is pretty much a necessity in my home. I watch YouTube videos and Netflix on it constantly, using my iPhone 4 as my remote control. I stream music directly from my iPhone or even my iMac (where I have access to 10,000+ songs I



have stored) so I can listen through my surround sound to my favorite tunes. I stream audio from my scanner apps and my LiveATC app; even my amateur radio EchoLink conversations take place with AirPlay and my Apple TV.

I recently even took it with me on a trip so I could connect it to the hotel WiFi network and watch movies in my hotel room through Netflix without paying the hotel extra for them.

If it seems like I didn't have to explain a lot about the interface, it is because I really didn't. Using it is simple and intuitive. Any questions you might have are easily answered by the set-up guide. Plus, the real bonus of Apple TV is interfacing your iOS device with your home theater system using AirPlay.

So, if you are wanting to combine streaming audio or video from your iOS device or computer with your home entertainment system, I cannot stress how much easier Apple TV makes everything. For \$99 USD, I cannot think of a more practical and useful device to add to your home entertainment system.

Apple TV can be purchased through online retailers like Amazon.com, or directly from any Apple Store or the Apple Web site.

WEBSITES

Apple TV - www.apple.com/appletv/
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What's NEW

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Larry Van Horn, New Products Editor

AirNav Live Flight Tracker 8 Released

Have you ever wondered whether it is possible to track in real time any flight over Europe, North America and other regions of the world?

If your answer is yes, then a new version of AirNav Live Flight Tracker might be of interest to you. Live Flight Tracker is the only flight tracking application that integrates flight data from the FAA Radar Systems (ASDI) and AirNav Systems worldwide Mode-S/ADS-B network, resulting in an average of 7,000 flights being tracked worldwide.

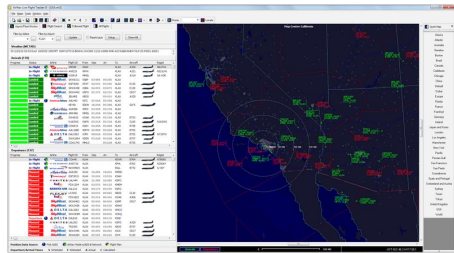
Some of the features of this new version include:

- New graphics and user interface.
- All airline and general aviation flights included: Allows the user to track blocked flights.
- New flight data source information.
- Allows the user to check aircraft registration.
- Optimized flight data processing routines.
- Auto detects your location.
- Automatic airport weather information / Real-time weather (METAR).
- Auto save of all application settings.
- Based on AirNav's robust RadarBox software technology.
- Different colors displayed for different flight stages.
- More frequent screen updates.
- Data Sources United States ASDI and RadarBox Worldwide Mode-S/ADS-B Network (Professional Edition can track flights using Flight Plan).
- FleetWatch Fleetwatch: monitor your fleet status H24.
- ADS-B Fully prepared for ADS-B NexGen technology – integrates ADS-B information.
- Low bandwidth requirement / faster downloads of data

This new version has a simple interface that lets you move your mouse over any of the program maps and over the aircraft icons to see detailed flight information (flight number, origin, destination, aircraft, altitude, heading, speed, elapsed and remaining time). You will also see detailed airport and airspace information.

AirNav promotes that they have more than 30,000 users. These users include NOAA, NASA, IBM, Sanford Airport Authority, Calgary Airport Authority, Delta Airlines, Honeywell, US Coast Guard, DaimlerChrysler, TV and radio stations and hundreds of airports, small jet operators and travel related companies.

Software operating system requirements are



simple – Microsoft Windows, any version and an Internet connection.

Below is the current pricing for this service.

- US Edition: All US/Canada flights: \$59.95 semi-annually or \$14.95 per month
- European Edition: European flights: 59.95 semi-annually or 14.95 per month
- Worldwide Edition: All flights in the system: 79.95 semi-annually or 19.95 per month
- Professional Edition: All flights in the system including access to blocked flights: \$149.95 per month or \$1299.95 per year (save 25%).

You can get more information on AirNav and all their products at www.airnavsystems.com/index.html.

Debuted at Dayton 2011

This year we sent our intrepid MT reporter, Bob Grove, to Dayton to check out what was new at the biggest show on the amateur radio calendar – 2011 Dayton Hamvention. When he got home, Bob handed me a huge package of stuff. So here is a taste of Whats New from this year's Hamvention.

The biggest attention getter this year came from Elecraft and their new 1.5 pound KX-3 transceiver. The KX-3 is a 10-Watt (160 to 6 meter) rig with the option to add an external 100-Watt (KXPA100) amplifier. The receiver is software-defined with an I/Q output and is direct conversion. At press time there was no announced selling price, but Elecraft says that ordering and shipping dates will be in the Fall-Winter of 2011. Check out www.elecraft.com/KX3/kx3.htm for more information on this product.



MFJ displayed their new six band QRP transceiver – the MFJ-9200. This 5-Watt CW rig covers 80 through 15 meters through the use of interchangeable band modules. The 9200 comes with one module (band is your choice), with additional modules available for sale at \$29.95 each.

There's also built-in iambic keying with a manual-key sensor, a programmable CQ message, and seamless QSK T/R switching. DDS frequency control delivers rock-solid stability, precise 100-Hz readout, and eight memory channels per band. Plus, you get a choice of three main-dial tuning rates and RIT with 10-Hz tuning resolution.



MFJ-9200 runs on any power source between 8 and 15 VDC and draws a miserly 40 mA on receive with the display backlight turned off – perfect for prolonged off-the-grid adventures.

MFJ also offers a wide range of QRP accessories to compliment the MFJ-9200 QRPocket CW Transceiver™. The MFJ-9200 retails for \$249.95 and you can get more details at www.mfjenterprises.com/Product.php?productid=MFJ-9217.

If you are interested in software defined radios, those were not in short supply and a couple of new items made it to Dayton. The WinRadio WR-G33DDC "Excalibur" made its Dayton debut (see our MT First Look Review in the November 2010 issue).

Excalibur's frequency coverage runs from 9 kHz to 50 MHz, and the WR-G33DDC boasts a frequency stability of 0.5 ppm and a dynamic range of 107 dB. It also offers a 50 MHz wide real-time spectrum analyzer with a waterfall display. You can get more information on this professional grade SDR on the Grove website at www.grove-ent.com.

SSB Electronics also debuted its new Perseus SDR software engine – V4.0a. You get details of all the new features included in this software package on the SSB website at www.ssb.de/.

If antennas are your thing, MFJ introduced the HyGain SPT-500, a 5/8 wavelength vertical antenna for 10 meters that sells for \$59.95. If 20 meters is your band, MFJ also debuted a portable 20-meter dipole, the MFJ-2299, a 1/2 wavelength antenna comprised of two telescoping elements. It also sells for \$59.95.

There were quite a few more products that Bob spotted at Dayton, but we just do not have room to run them all. But keep an eye on our MT First Look review column in the future for reviews on things Bob brought back from this year's Hamvention.

New Icom Receiver Software Update Released

Icom has released a software update – Version 2.20 – for the IC-PCR1500/2500 and IC-R1500/2500 receivers which give the user a compatible Microsoft Windows® 7 package. The update can be found on the Icom Japan website at:

www.icom.co.jp/world/support/download/firm/IC-R1500_PCR_R2500_PCR/2_20c/index.html

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, larryvanhorn@monitoringtimes.com.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of Monitoring Times magazine.

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Digital TV Audio?

Hello, Ken,

I liked your article on the portable TV's [April Beginner's Corner]. As soon as they came out for DTV I bought one on sale. My main reason for the email was, did you happen to notice if anyone sells a radio with audio for the new DTV? I currently have some older 5 band radios I that have AM/FM/TV1/TV2/WX.

Frank Barren KB3EJV

Thanks for your comments, Frank. I'm afraid that the days of multi-band radios that include the audio from the TV band are a thing of the past. Unlike the old analog TV era where the audio was an FM modulated subcarrier of the VHF or UHF transmission, digital TV audio is part of the digital stream sent along with the picture. Any receiver capable of tuning the audio would be tuning the video as well, and the manufacturer would want to display that.

But, now that we have ever smaller portable TV sets, they're looking at the product from the other way around. I found this Access HD DTV portable set that has a built-in AM and FM radio. Since most DTV stations have a weather channel, you effectively have an AM/FM/WX/TV portable, but with pictures and radar screen to boot!

One other problem that such sets have that



analog sets didn't have is trying to lock on the digital signal from any distance away. The old analog radios could tune in the FM subcarrier's booming signal with ease; not so with DTV. And, you could run those old analog multi-band radios for weeks without worrying about the batteries. The new sets? A couple of hours at best.

Ken KS4ZR

China and Russia

Hi, Fred,

I always enjoy your MT column, and your recent comments in the April issue got me to write. I've been listening to China's shortwave radio since it was Radio Peking in the early 1970's. Their content over the years has certainly changed! The strong communist and class-struggle was very dry, but so different from anything coming out of mainstream America. I tuned in to

hear the wonderful Chinese folk music.

Nowadays, CRI has very little if any shows devoted this type of music. *China Drive* is the worst program on shortwave today. I cannot listen to it for more than a minute before I must tune elsewhere. The station has become so westernized that sometimes it's hard to distinguish it from our current western radio that's programmed a thousand miles away from where it is heard. I guess there's no turning back on this homogenization of world cultures.

I loved your story about your immersion in all things Russian. It must have been very interesting and a real asset when scanning the bands. I spent many hours listening to Radio Moscow (in English) and their slant on politics and culture. Alas, Russian radio has gone the way of CRI and made their radio shows sound like what they think the west wants to hear. Oh well, I guess I'm showing my age!

Keep up the great columns, Fred. Yours is one of the reasons I'm still subscribing to *Monitoring Times*.

Rob Holman

Hi, Rob,

Thanks so much for your kind note and feedback on my column. It's much appreciated.

I think we see things about the same...so many international broadcasters (and now net-casters) seem to think we want to hear exactly that which we can hear on this side of the world, but it's not true. What made/makes them unique is stuff that we cannot hear here. Sadly they all want to be clones of US/Canadian broadcasters. Pity.

There was something almost "naughty" about listening to ideological foes during the Cold War. I kind of miss those days. Kind of. Whether CRI and Voice of Russia in 2011 are an accurate reflection of their countries is the 64 dollar question and makes them worth listening to.

Fred

One More Museum

Howdy, Ken,

I note that every article I see in magazines about radio museums seems to miss the ONE that I have personally seen and been boggled by: www.pavekmuseum.org/

This one absolutely blew my mind in about 1998, while I was in Minneapolis for a summer meeting (and training workshop) of a national committee of transportation radio frequency coordinators (for AASHTO). I wailed and moaned and gnashed my teeth that I did NOT have a digital camera for the event. I saw stuff so rare that I thought I would never see its equal, only to see several variants in addition to the one I'd seen in the past.

It had original tape recorders for the Bing Crosby Show that had been brought over from Germany, ancient TV receivers with mirror lids, a

whole broadcast station studio set up, an original Therman from the '30s, whole wall segments devoted to various models from different manufacturers, military equipment, etc.

And for a treat, the guide led us into another area of about the same size of the museum, where they not only stored possible exhibit materials donated, but we got to talk to the 70+ year old tech who was working on bringing equipment up to a display or example state of working! It was a few bucks well spent and an afternoon to remember.

Enjoyed your article. I hope to one day get to visit more museums of radio lore.

Rick Herndon K5FNI, retired AASHTO radio frequency coordinator and radio engineer



Hi, Rick,

Thanks for the "up close and personal" account of your visit to the Pavek Museum. I hope other MT readers will get the chance to do so this summer as well. The Pavek Museum did appear in the article, listed as "Museum of Broadcasting," though its web site is called www.pavekmuseum.org. Hours, directions, admission, etc. are also in that listing. The museum was also listed in last year's MT radio museum guide, again listed as it is named. Hope you enjoyed last month's semi-annual vintage radio special with its eye-popping collection of some of the most colorful radios ever made.

(Courtesy: Pavek Museum of Broadcasting)



One final note, I did manage to misplace the Antique Wireless Association Museum, which several readers were kind enough to point out. Our own Kevin Carey noted that the address is 8 South Avenue East Bloomfield, NY 14443.

Ken KS4ZR

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com

*Happy monitoring!
Rachel Baughn, Editor*

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- Optional LAN interface unit enables control via the internet
- Optional I/Q output port allows capture of up to 1 MHz onto a computer hard drive or external storage device
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These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of *Monitoring Times*.

AMERICAN BANDSCAN
<http://americanbandscan.blogspot.com/> - by Doug Smith

ANTENNA TOPICS
[www.wa5vjb.com](http://wa5vjb.com) - by Kent Britain

BELOW 500KHZ
<http://below500khz.blogspot.com/> - by Kevin Carey

FED FILES
<http://mt-fedfiles.blogspot.com/> - by Chris Parriss

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